

**INSTRUCTION BOOK**  
**T212A**  
**DATA MODEM**

**PART OF**  
**FLIGHT SERVICE AUTOMATION SYSTEM**

**CONTROLLED  
DOCUMENT**

**CONTRACT DTFA01-81-C-10039**

**CONTRACTOR**

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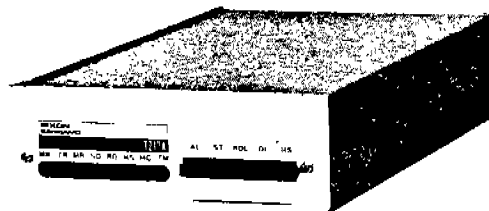
**U.S. DEPARTMENT OF TRANSPORTATION**  
**FEDERAL AVIATION ADMINISTRATION**

T212A DATA MODEM  
OPERATION AND MAINTENANCE

## T212A DATA MODEM

### DESCRIPTION AND OPERATION

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**Fig. 1-1. T212A Data Modem**

#### 1. GENERAL

##### A. Introduction

**1.01** This section consists of information on features, accessories, configurations, and specifications of the RIXON® T212A Data Modem. A brief functional description and detailed operating procedures are also provided for the T212A Data Modem shown in Fig. 1-1.

**1.02** This section is being reissued to reflect the following new information:

- Addition of AE186 telephone in Table 1-A and in telephone operating procedures.
- Addition of part number for new cable to interconnect the data modem and 500-type telephone in Table 1-A.
- Deletion of enclosure-only model list and part number information in Table 1-B.
- Addition of data modem dimension information in Table 1-C.

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**1.03** The T212A Data Modem, part number 905-5084, is a full-duplex modulator/demodulator (modem) used over Direct Distance Dial (DDD) switched networks. The T212A provides serial binary data transmission and reception at either 0 to 300 or 1200 bits per second (bps).

## **B. Data Modem Features**

**1.04** The data modem has many outstanding features. The following lists some of the main features:

- Large Scale Integrated (LSI) and hybrid circuitry for improved reliability and reduced size.
- Compatibility with Western Electric 103, 113, and 212 Data Sets; RIXON 103 and 113 Data Modems.
- Compatibility with Western Electric 801 Automatic Calling Units (ACUs).
- Frequency Shift Keyed (FSK) or differentially coherent four-phase (PSK) modulation automatically selected when operating format is selected.
- EIA RS-232-C, and CCITT recommendation V.24 interface (modified).
- Front panel Light Emitting Diode (LED) status indicators.

## **C. Data Modem Accessories**

**1.05** Figure 1-2 shows accessories available for use with the data modem and Table 1-A provides a list of accessory part numbers. This equipment is optional unless specified. Accessory equipment is available from Rixon Inc.

## **2. PHYSICAL DESCRIPTION**

### **A. Configurations**

**2.01** The data modem is available in two basic configurations:

- C212A-L1A card set, shown in Fig. 1-3. Used in optional multiple data modem enclosures.

- T212A-L2 standalone enclosure only with stepdown transformer and power cord.

**2.02** The C212A-L1A card set is 1.4 inches (3.6 cm) high, 5.6 inches (14.3 cm) wide, 10.5 inches (26.7 cm) deep, and weighs approximately 6 lb (2.7 kg).

**2.03** A list of data modem part numbers is provided in Table 1-B. Unless specific differences between the C212A-L1A and T212A-L1A/2 Data Modem are being referred to, this manual uses the general T212A designation.

## **B. Specifications**

**2.04** A list of mechanical and electrical specifications for the T212A Data Modem is provided in Table 1-C.

## **3. FUNCTIONAL DESCRIPTION**

**3.01** The T212A Data Modem has two printed circuit cards which are interconnected by a flexible ribbon cable. Mounted on the smaller circuit card is a series of hybrid filter circuits and an attenuator network. All other functions are performed on the main circuit card.

**3.02** Most main card functions are performed within the A1 and A2 LSI chips. MSI and discrete circuitry around the LSI chips are used for ring and carrier detection, telephone and terminal interface protection, signal amplification, and status indication. A detailed theory of operation is provided in the T212A Data Modem Maintenance Manual.

## **4. DATA MODEM STATUS LAMPS**

**4.01** The status lamps shown in Fig. 1-4 monitor interface and control circuits, and are used for rapid fault isolation. Status lamp names and functional descriptions are provided in Table 1-D.

## **5. OPERATION**

### **A. Introduction**

**5.01** The T212A Data Modem has three operating formats:

- Asynchronous, 0 to 300 bps.
- Synchronous, 1200 bps.
- Character asynchronous with data in 9- or 10-bit character, 1200 bps (+1, -2.5%).

Changing operating formats during the data portion of a call is not possible and should not be attempted.



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Fig. 1-2. Data Modem Accessories

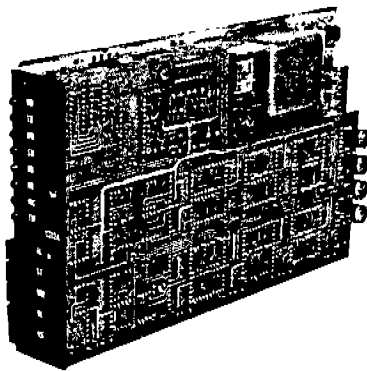
TABLE 1-A ACCESSORY DESCRIPTIONS AND PART NUMBERS		
FIG. 1-2 REF. NO.	DESCRIPTION	RIXON PART NO.
1	500 telephone with rotary dial and isolated hookswitch contact capability.	385-0500-100
—	2500 telephone with tone dial and isolated hookswitch contact capability (not shown).	385-2500-100
2	565 telephone with rotary dial.	385-0565-044
—	2565 telephone with tone dial (not shown).	385-2565-044

TABLE 1-A (Cont)

## ACCESSORY DESCRIPTIONS AND PART NUMBERS

FIG. 1-2 REF. NO.	DESCRIPTION	RIXON PART NO.
3	2503 (RTC) with tone dial. 503 (RTC) with rotary dial (not shown).	Not supplied by Rixon.
—	AE186 (HC8666000ASL) telephone with rotary dial (not shown). AE186 (HC8666000JSL) telephone with tone dial (not shown).	Not supplied by Rixon.
4	Extender card.	905-6330-01
5	Multiple data modem mounting (RM40A1).	*905-5073-01
—	Multiple data modem mounting (RM40A3 not shown).	*905-5096-xxx
6	565 or 2565 telephone, data modem, and DDD network interconnecting cable, — for adjustable transmit level applications, with spade lugs.	905-6414-01
	— for fixed loss loop applications.	905-6414-02
	— for programmable applications.	905-6414-03
	— for adjustable transmit level applications, with Telco jacks.	905-6414-04
	— for permissive transmit level applications.	905-6414-05
—	Data modem connecting cable, automatic answer without a telephone, — for adjustable transmit level applications, with spade lugs.	905-4962-01
	— for programmable applications.	905-6557-01
	— for fixed loss loop applications.	905-6557-02
	— for permissive applications.	905-6557-03
—	Data modem connecting cable, provides a talk/data switch for use with a standard 500 telephone, — for programmable applications, with data lamp.	905-6592-01
	— for fixed loss loop applications.	905-6592-02
—	Data modem connecting cable, provides a data switch for use with a 500 telephone (with isolated hookswitch contacts), — for programmable applications, with data lamp.	905-6608-01
	— for fixed loss loop applications.	905-6608-02
—	Data modem connecting cable, provides a data switch for use with a 500 telephone (with isolated hookswitch contacts), — for permissive applications.	905-6609-01
	— for permissive applications, with data lamp.	905-6609-02
—	Data modem connecting cable, provides a talk/data switch for use with a standard 500 telephone, — for permissive applications.	905-6611-01
	— for permissive applications, with data lamp.	or 905-6675-01 905-6611-02

TABLE 1-A (Cont)		
ACCESSORY DESCRIPTIONS AND PART NUMBERS		
FIG. 1-2 REF. NO.	DESCRIPTION	RIXON PART NO.
—	Data modem connecting cable to 565 telephone and 801C-L1/2 ACU, — for adjustable applications, with spade lugs. — for fixed loss loop applications. — for programmable applications. — for adjustable applications, with Telco jack. — for permissive applications.	905-6630-01 905-6630-02 905-6630-03 905-6630-04 905-6630-05
* Refer to RM40A1 Data Mounting Manual (Bulletin 5217) or RM40A3 Data Mounting Manual (Bulletin 5243) for further information.		



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Fig. 1-3. C212A-L1A Card

TABLE 1-B			
T212A CONFIGURATIONS			
PART NO. DASH NO.	905-5084 -264	905-5084 -164	905-5084 -064
MODEL NO. LIST NO.	C212A L1A	T212A L1A/2	T212A L2
FEATURE	CONFIGURATION		
Card set	X	X	
Desk-top enclosure and stepdown transformer.		X	X

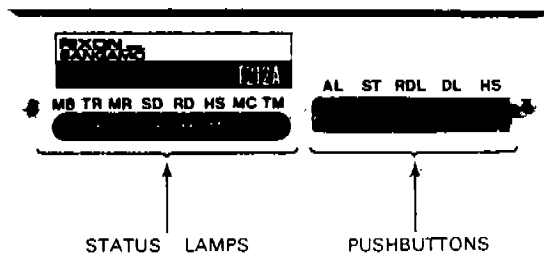
TABLE 1-C	
LIST OF SPECIFICATIONS	
ITEM	SPECIFICATION
Input data format	Serial, binary.
Operational mode	Full duplex.
Line requirement	Switched DDD network.

TABLE 1-C (Cont)

## LIST OF SPECIFICATIONS

ITEM	SPECIFICATION
Transmission speed: Low speed High speed	0 to 300 bps, asynchronous. 1200 bps, ( $\pm 0.01$ percent) synchronous or (+1.0, -2.5 percent) character-asynchronous.
Modulation: Low speed High speed	Frequency Shift Keyed (FSK). Phase Shift Keyed (PSK).
Nominal frequencies for low speed: Originate mode Transmit mark Transmit space Answer mode Transmit mark Transmit space	1270 Hz 1070 Hz 2225 Hz 2025 Hz
High speed carrier frequencies: Originate mode Answer mode	1200 Hz 2400 Hz
Transmit signal level	0 to -15 dBm adjustable in 1-dB steps. 0 to -12 dBm programmable in 1-dB steps. - 9 dBm permissive. - 4 dBm fixed loss loop.
Receive signal level range	0 to -44 dBm.
Power requirements: Standalone unit Card modem	105-129 Vac 57-63 Hz, 10 watts maximum. 24V rms, CT 47-63 Hz, 10 watts maximum.
Operating temperature	0° to 50° C.
Data interface	In accordance with EIA RS-232-C except for pins 18, 19, 21, and 25.
Dimensions: Height Width Depth	2.25 inches (5.7 cm). 5.75 inches (14.6 cm). 11.25 inches (28.6 cm).
Net weight Shipping weight	5 lb (2.3 kg). 7 lb (3.2 kg).





80003-0

Fig. 1-4. Operating Controls and Lamps

**5.02** Originating site speed selection is accomplished by the HS pushbutton shown in Fig. 1-4 or by data terminal interface control. At the answering station the T212A Data Modem automatically adjusts to the speed of the originating site unless optioned otherwise.

**5.03** A data-rate high-only option is provided which causes the data modem to block low speed transmission and reception. When the synchronous 1200 bps format is selected transmit and receive clocks are provided to the terminal interface. Option switches are provided to select either the synchronous or character asynchronous operating format.

**5.04** During character asynchronous operation characters arrive at the terminal interface at random intervals. Character asynchronous operation is not bit asynchronous like the low speed mode but it gives the appearance of asynchronous operation to the terminal. Each character consists of a start bit, stop bit, and seven or optionally eight information bits.

TABLE 1-D		
STATUS LAMPS		
LAMP	NAME	DESCRIPTION
MB	Make Busy	Lights if data modem is optioned for tip-ring make busy when: <ul style="list-style-type: none"> <li>• Data modem is in analog loopback.</li> <li>• Customer control of CN is optioned yes and CN interface is on or open.</li> </ul>
TR	Terminal Ready	Lights when terminal lead Data Terminal Ready is on.
MR	Modem Ready	Lights when data modem is in data mode.
SD	Send Data	Lights when Transmitted Data terminal lead is spacing.
RD	Receive Data	Lights when Received Data terminal lead is spacing.
HS	High Speed	Lights when data modem is in high-speed mode.
MC	Modem Check	<ul style="list-style-type: none"> <li>• Idle state — indicates power on.</li> <li>• Testing — indicates errors.</li> <li>• Data mode — off when valid carrier is received.</li> </ul>
TM	Test Mode	Lights during test mode.

**5.05** Paragraphs 5.01 through 5.04 indicate the versatility of the T212A Data Modem. Because the T212A Data Modem is so versatile a large number of optioning decisions must be made prior to or during installation. Proper operation is possible only after proper option installation. Refer to the Installation and Connection section of this manual for option descriptions and installation procedures.

**5.06** Operating procedures for each operating format (low speed asynchronous, high speed synchronous, and high speed character asynchronous) are the same.

**5.07** Only one of the five data modem pushbuttons is an operating control (HS). Prior to entering the data mode the HS pushbutton is pressed in to select the high speed operating format as explained in Paragraph 5.02.

**5.08** The T212A Data Modem may be used with the following telephone and cable; and Automatic Calling Unit arrangements to provide a variety of voice/data applications on the DDD switched telephone network.

- A 500/2500 telephone and three-position cable switch provide manual origination and automatic answering of data calls. This arrangement is for applications where, for example, the telephone is used for normal voice or manual data call origination during the day, and after hours for unattended automatic answering of data calls. The switch on the DDD cable can be left in the VOICE ONLY position to inhibit the automatic answer feature.
- A 500/2500 telephone and two-position cable switch provide manual data call origination and automatic answering. This arrangement is for applications requiring voice communication, data call origination, and automatic answer. This arrangement does not provide for manual inhibit of the automatic answer feature.
- An RTC (503/2503) telephone and appropriate DDD cable provide manual origination and automatic answering of data calls. This arrangement is for applications requiring voice communications, data call origination, and automatic answer. This arrangement does not provide for manual inhibit of the automatic answer feature.

**NOTE:** *This arrangement is for the T212A Series 9 and above only. Series number information is found on the nameplate attached to the bottom of the enclosure.*

- A 565/2565 or AE186 telephone and appropriate DDD cable provide normal voice communication, manual data call origination, and manual or automatic answering. This arrangement is for applications requiring manual origination, manual answering, or automatic answering of data calls.
- A modified 565/2565 telephone and appropriate cable provide each of the standard 565/2565 operating modes. In addition, it also provides for manual inhibit of the automatic answer feature.
- An Automatic Calling Unit (ACU) provides terminal equipment initiated dialing. An ACU may be operated with a T212A and either with or without a telephone.
- Applications for data-only answer-only service do not require a telephone when the data modem is optioned for automatic answer.

A telephone which uses line pushbuttons to select one or more data lines is referred to in this manual as a multiple line telephone. The multiple line telephones referred to in this manual include the 565, 2565, and AE186 telephone. A 2 at the beginning of the 2565 telephone model number designates a tone dial telephone. An A in the AE186 telephone manufacturers part number (HC8666000ASL) designates a rotary telephone. A J in the AE186 telephone manufacturers part number (HC8666000JSL) designates a tone dial telephone. Since both rotary and tone dial telephones interact with the T212A in the same manner, the rotary dial telephones are referred to in the following operating procedures to denote either telephone type.

**5.09** An answering modem abort timer in the T212A Data Modem causes the modem to disconnect from the telephone line 13 seconds after sending answer tone if it does not receive carrier from the originating data modem.

**5.10** An optional originate mode abort timer in the T212A Series 9 and above is for use when operating with an RTC telephone. The abort

timer automatically disconnects from the telephone line 13 seconds after entering data mode if it does not receive answer tone from the called station.

## B. Operating with a 500 Telephone and a Two-Position Cable Switch

5.11 The 500 telephone shown in Fig. 1-5 is used in conjunction with a two-position toggle switch that is part of the DDD cable arrangement. The normal (up) position provides normal voice communications, manual call origination, and automatic answer for a properly optioned T212A. The DATA (down) position (nonlocking) is used to transfer normal originated voice calls to data mode.

### Manually Originating

5.12 To manually originate data calls using a 500 telephone and two-position DDD cable switch proceed as follows:

- (a) Verify that data modem power is on.
- (b) Lift telephone handset and dial call in normal manner.
- (c) After call is answered verify that data modem TR lamp is lighted.
- (d) If remote site answers manually, request attendant to enter data mode first. If remote site answers automatically, enter data mode upon receipt of answer tone.

**NOTE:** *Transfer to data mode must take place within ten seconds after answer tone begins.*

- (e) To enter data mode, press and hold DATA switch to the DATA position while placing the telephone handset on hook. After data modem MR lamp lights, release the DATA switch.

**NOTE:** *Some versions of the DDD cable DATA switch have a DATA lamp to indicate when the data modem has entered the data mode. This lamp can be used in place of the data modem MR lamp to indicate when to release the DATA switch.*

- (f) Data transmission can begin.



80002-1

**Fig. 1-5. 500 Telephone and Two-Position DDD Cable Switch**

### Automatically Answering

5.13 To automatically answer data calls using a 500 telephone and appropriate DDD cable proceed as follows:

- (a) Verify that data modem is optioned for automatic answer.
- (b) Verify that data modem power is on.
- (c) Verify that data modem TR lamp is lighted.
- (d) When the data modem is in the data mode, the data modem MR lamp is lighted.

### Terminating a Data Call

5.14 After the transmission is completed the data call can be terminated in one of the following ways:

- To manually disconnect, lift telephone handset off hook momentarily, and then replace on hook. The attendant at the remote site should follow the same procedure to ensure data call termination. If prearranged, voice communication is possible before replacing the telephone handset on hook.
- The call can be terminated automatically when the Data Terminal Ready leads (CD) are turned off at both sites.

- If the local site has the loss of carrier disconnect feature optioned yes (S) the data call is terminated when the remote site stops sending carrier.
- When data modems are optioned for space disconnect (T and V), the data call is terminated when data modem receives a steady space.

### C. Operating with a 500 Telephone and Three-Position Cable Switch

5.15 The 500 telephone as shown in Fig. 1-6 is used in conjunction with a three-position toggle switch that is part of the DDD cable arrangement. The VOICE ONLY (up) position of the switch inhibits (manual or automatic) answering of data calls. The ALT VOICE/DATA AUTO ANS (center) position permits the T212A (if optioned for automatic answer) to automatically answer incoming data calls under control of the data terminal equipment. The DATA (down) position is used to transfer normal originated voice calls to data mode.



80001-1

Fig. 1-6. 500 Telephone and Three-Position DDD Cable Switch

### Manually Originating

5.16 To manually originate data calls using a 500 telephone and three-position DDD cable switch proceed as follows:

- (a) Verify that data modem power is on.
- (b) Lift telephone handset, and dial call in normal manner.
- (c) After call is answered verify that data modem TR lamp is lighted.
- (d) If remote site answers manually, request attendant to enter data mode first. If remote site answers automatically, enter data mode upon receipt of answer tone.

**NOTE:** *Transfer to data mode must take place within ten seconds after answer tone begins.*

- (e) To enter data mode, press and hold VOICE/DATA switch to the DATA position while placing the telephone handset on hook.
- (f) Release the VOICE/DATA switch.
- (g) After data modem MR lamp lights, data transmission can begin.

**NOTE:** *Some versions of the DDD cable VOICE/DATA switch have a DATA lamp to indicate when the data modem has entered data mode. This lamp can be used in place of the data modem MR lamp to indicate when to release the VOICE/DATA switch.*

### Automatically Answering

**5.17** To automatically answer data calls using a 500 telephone and three-position DDD cable switch proceed as follows:

- (a) Verify that data modem is optioned for automatic answer.
- (b) Place VOICE/DATA switch to ALT VOICE/DATA AUTO ANS (center) position.
- (c) Verify that data modem power is on.
- (d) Verify that data modem TR lamp is lighted.
- (e) When the data modem is in the data mode, the data modem MR lamp is lighted.

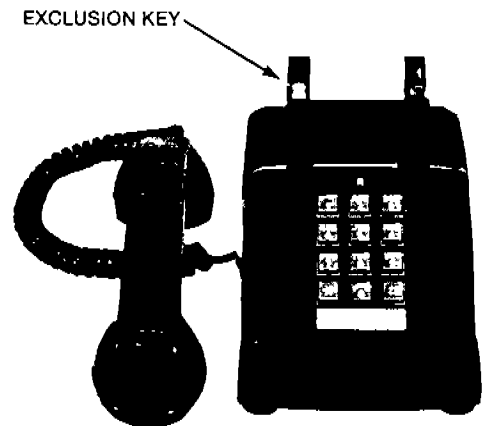
### Terminating a Data Call

**5.18** After the transmission is completed, the data call can be terminated in one of the following ways:

- To manually disconnect, place the DDD cable switch to the VOICE ONLY position, momentarily lift the telephone handset and replace it on hook. The attendant at the remote site should follow the same procedure to ensure data call termination. If prearranged, voice communication is possible prior to placing the telephone handset on hook.
- The call can be terminated automatically when the Data Terminal Ready leads (CD) are turned off at both sites.
- If the local site has the loss of carrier disconnect feature optioned yes (S) the data call is terminated when the remote site stops sending carrier.
- When data modems are optioned for space disconnect (T and V), the data call is terminated when data modem receives a steady space.

### D. Operating with an RTC Telephone

**5.19** The RTC telephone shown in Fig. 1-7 is equipped with an exclusion key. Lifting the telephone handset off hook and pulling up the exclusion key provides normal voice communication and manual data call origination. Replacing



80004-0

**Fig. 1-7. RTC Telephone and Control**

the handset returns the exclusion key and terminates the voice call, provided Data Terminal Ready (CD) is off. With Data Terminal Ready on, replacing the handset places the modem in the data mode.

### Manually Originating

**5.20** To manually originate data calls using an RTC telephone and appropriate DDD cable proceed as follows:

- (a) Verify that data modem power is on.
- (b) Lift telephone handset off hook, pull up exclusion key, and dial call in normal manner.
- (c) After call is answered verify that data modem TR lamp is lighted.
- (d) If remote site answers manually, request attendant to enter data mode first. If remote site answers automatically, enter data mode upon receipt of answer tone.

**NOTE:** Transfer to data mode must take place within ten seconds after answer tone begins.

- (e) To enter data mode, place telephone handset on hook.
- (f) After data modem MR lamp lights, data transmission can begin.

### Manually Answering

**5.21** To manually answer data calls using an RTC telephone and appropriate DDD cable proceed as follows:

- (a) When telephone rings, lift handset off hook, pull up exclusion key, and answer in normal manner.
- (b) Verify that data modem TR lamp is lighted.
- (c) When ready to enter data mode, place telephone handset on hook.
- (d) After data modem MR lamp lights, data transmission can begin.

### Automatically Answering

**5.22** To automatically answer data calls using an RTC telephone and appropriate DDD cable proceed as follows:

- (a) Verify that data modem is optioned for automatic answer.
- (b) Verify that data modem power is on.
- (c) Verify that data modem TR lamp is lighted.
- (d) When data modem is in data mode, data modem MR lamp is lighted.

### Data to Talk Transfer

**5.23** To transfer from data to talk mode in an RTC configuration proceed as follows:

- (a) Lift telephone handset off hook and pull up exclusion key.
- (b) Verify that data modem MR lamp goes out.
- (c) Data modem is now in talk mode. If additional data transmission is required, the answering modem must return to data mode first. Ensure that TR lamp is lighted and then place telephone handset on hook.

### Terminating a Data Call

**5.24** After the transmission is completed the data call can be terminated in one of the following ways:

- The call can be terminated automatically when the Data Terminal Ready leads (CD) are turned off at both sites.
- If the local site has the loss of carrier disconnect feature optioned yes (S) the data call is terminated when the remote site stops sending carrier.
- When the data modems are optioned for space disconnect (T and V), the data call is terminated when the data modem receives a steady space.

### E. Operating with a Multiple Line Telephone

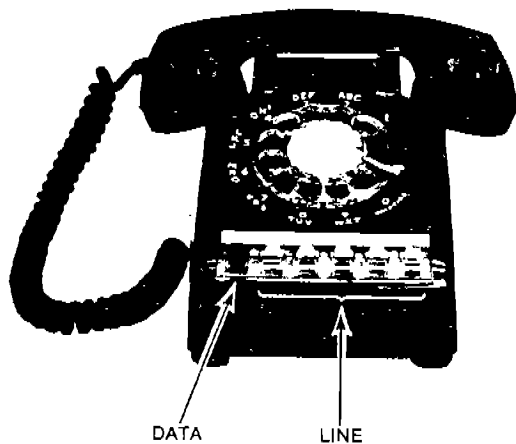
**5.25** As shown in Fig. 1-8 the 565 telephone has six pushbuttons. The first (DATA) pushbutton on the extreme left is nonlocking and releases any of the other five pushbuttons when it is pressed and released to enter data mode. The remaining five (LINE) pushbuttons are used to select the required data line.

**NOTE:** The AE186 telephone has five line pushbuttons and one hold pushbutton. After performing the modification described in the 200 section, the hold pushbutton is nonlocking and functions the same as the 565 DATA pushbutton. Therefore the following references to the 565 may be used to denote either multiple line telephone.

### Manually Originating

**5.26** To manually originate data calls using a 565 telephone and appropriate DDD cable proceed as follows:

- (a) Verify that data modem power is on.
- (b) Press appropriate telephone LINE key, lift handset, and dial call in normal manner.



80005-0

**Fig. 1-8. 565 Telephone and Controls**

(c) After call is answered, verify that data modem TR lamp is lighted.

(d) If remote site answers manually, request attendant to enter data mode first. If remote site answers automatically, enter data mode upon receipt of answer tone.

**NOTE:** *Transfer to data mode must take place within ten seconds after answer tone begins.*

(e) To enter data mode, press DATA key until LINE key lights.

(f) Verify that data mode has been entered (MR lamp lighted) and telephone LINE key releases as DATA key is released.

(g) Place telephone handset on hook.

(h) Data transmission can begin.

#### **Manually Answering**

**5.27** To manually answer data calls using a 565 telephone and appropriate DDD cable proceed as follows:

(a) When telephone rings, press LINE key that lights during ringing.

(b) Lift handset off hook and answer in the usual manner.

(c) Verify that data modem TR lamp is lighted.

(d) When ready to enter data mode, press DATA key until LINE key lights.

(e) Verify that data mode has been entered (MR lamp lighted) and telephone LINE key releases as DATA key is released.

(f) Place telephone handset on hook.

(g) Data transmission can begin.

#### **Automatically Answering**

**5.28** To automatically answer data calls using a 565 telephone and appropriate DDD cable proceed as follows:

(a) Verify that data modem is optioned for automatic answer.

(b) Ensure that data modem power is on.

(c) Verify data modem TR lamp is lighted.

(d) When data modem is in data mode, telephone LINE key and data modem TR and MR lamps are lighted.

#### **Data to Talk Transfer**

**5.29** To transfer from data to talk mode using a 565 telephone and appropriate DDD cable proceed as follows:

(a) Lift handset off hook and press LINE key.

(b) Verify that LINE key lamp goes out.

(c) Data modem is now in talk mode. If additional data transmission is required, return to data mode by following the procedures described in Manually Originating.

## Terminating a Data Call

**5.30** After the transmission is completed the data call can be terminated in one of the following ways:

- To manually disconnect, press the appropriate lighted line key, lift telephone handset off hook then place handset on hook. The attendant at the remote site should follow the same procedure to ensure data call termination.
- If voice communication is not required after data transmission, the call can be terminated automatically when the Data Terminal Ready leads (CD) are turned off at both sites.
- If the local site has the loss of carrier disconnect feature optioned yes (S) the data call is terminated when the remote site stops sending carrier.
- When data modems are optioned for space disconnect (T and V), the data call is terminated when data modem receives a steady space.

## F. Operating with a Multiple Line Telephone Modified for Auto-Answer Inhibit

**5.31** When automatic answer is required the data modem is optioned for permanent automatic answer. However, occasionally it may be desirable to block incoming calls. This may be done in single line applications by using a multiple line telephone modified for auto-answer inhibit. For modification procedure refer to the Installation and Connection section of this manual.

**5.32** Operation of an auto-answer inhibit telephone is identical to operation of an unmodified multiple line telephone with the following exceptions:

- Only used in single line applications.
- First line key is released for automatic answer and pressed for normal operation.
- When transferring from data to talk mode the telephone handset must be off hook before pressing line key.

- When terminating data calls at telephone set leave handset on hook and press line key.

**NOTE:** *Telephones modified for auto-answer inhibit cannot be installed behind a PBX or where A isolated hookswitch contacts are used. Incoming calls may always see a busy line.*

## G. Operating with an Automatic Calling Unit

**5.33** An 801A (pulse dial) or 801C (tone dial) Automatic Calling Unit (ACU) can be used with the data modem to automatically originate a data call. The business machine must be programmed to provide dialing information directly to the ACU and to control the interface functions of the data modem. If a telephone is not required for voice communication or manual answering, the telephone may be omitted from the configuration.

## H. Operating without a Telephone

**5.34** If the T212A Data Modem is optioned for automatic answer, the only requirements at the answering site are that ac power is applied to the data modem (MC lamp lighted), the terminal is ready for data communications (TR lamp lighted), and proper connection is made to the telephone network.

## 6. REFERENCES

**6.01** The following publications provide additional information for standalone and multiple installations using T212A Data Modems.

SECTION	TITLE
5454-200	T212A Data Modem Installation and Connection
5454-300	T212A Data Modem Self-Diagnostics
5454-500	T212A Data Modem Tests Using External Test Equipment
5473	T212A Users Manual
5492	T212A Maintenance Manual



## T212A DATA MODEM

### INSTALLATION AND CONNECTION

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A. Introduction .....	6	1. GENERAL	
B. Data Modem Disassembly and Reassembly .....	11	A. Introduction	
C. Option Installation .....	12	1.01 Information required to install and connect RIXON® T212A Data Modems is contained in this section. The data modem should be in- stalled and optioned in conformance with instruc- tions given in this section. Installation and connection information for C212A Data Modems in multiple mountings is provided in appropriate data mounting Installation and Maintenance Manuals.	
3. CONNECTIONS .....	15	1.02 This section is being reissued to reflect the following new information:	
A. Location Requirements .....	15	• Clarification and addition of notes in Table 2-B.	
B. Power Requirements .....	15	• Clarification of note in Table 2-C.	
C. Business Machine Interface Requirements .....	15	• Changing of Tables 2-D and 2-E, Fig. 2-2, and corresponding text to agree with blue option cards added to this manual.	
D. Telephone Interface Requirements .....	17	• Addition of precautionary information to paragraph 3.01, in compliance with Part 15 of FCC Rules, concerning possible radio in- terference.	
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#### NOTICE

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- Correction of sequence of Figs. 2-8A and 2-9.
- Clarification of notes of USOC jacks on Figs. 2-8, 2-8A, 2-13, 2-17, 2-20, and 2-30.
- Correction of switch assembly drawings on Figs. 2-8 and 2-8A.
- Revision of AE186 telephone schematic diagram in Fig. 2-36.

**TABLE 2-A**  
**FCC REGISTERED APPLICATIONS**

APPLICATION	TELEPHONE TYPE	AUXILIARY EQUIP. USED	TRANSMIT LEVEL APPLICATION	RECOMMENDED CONNECTION CONFIGURATION USOC	TEL. LINE INTERCONNECT CABLE	CONN. DIAG. FIG. NO.
Data and voice only; or alternate voice and data with automatic answer	§500 or 2500; or *500 or 2500 with isolated hookswitch contacts	None	Permissive	RJ11, RJ12, RJ13, RJ41S, RJ45S	905-6611-01 †905-6611-02 series 0	2-8
				RJ11	905-6611-01 †905-6611-02 series 1	
				RJ11, RJ12, RJ13, RJ41S, RJ45S	905-6675-01	2-8A
Data only; or alternate voice and data with automatic answer	§500 or 2500 with isolated hookswitch contact		Programmable	RJ41S or RJ45S	905-6592-01	2-9
			Fixed loss loop	RJ41S	905-6592-02	2-10
					905-6608-02	2-11
			Programmable	RJ41S or RJ45S	905-6608-01	2-12
			Permissive	RJ41S, RJ45S, or RJ11	905-6609-01	2-13
					†905-6609-02	2-13
	‡RTC	RJ36X	Fixed loss loop	RJ41S	905-6557-02	2-14
			Programmable	RJ41S or RJ45S	905-6557-01	2-15
			Permissive	RJ41S, RJ45S, or RJ16X	905-6557-03	2-16
	565 or 2565	None			RJ41S, RJ45S, or RJ11	905-6414-05
			Programmable	RJ41S or RJ45S	905-6414-03	2-18
			Fixed loss loop	RJ41S	905-6414-02	2-19

TABLE 2-A (Cont)						
FCC REGISTERED APPLICATIONS						
APPLICATION	TELEPHONE TYPE	AUXILIARY EQUIP. USED	TRANSMIT LEVEL APPLICATION	RECOMMENDED CONNECTION CONFIGURATION USOC	TEL. LINE INTERCONNECT CABLE	CONN. DIAG. FIG. NO.
Data with automatic answer only	None	None	Permissive	RJ41S, RJ45S, or RJ11	905-6557-03	2-20
			Fixed loss loop	RJ41S	905-6557-02	2-21
			Programmable	RJ41S or RJ45S	905-6557-01	2-22
Multiple lines and multiple data modems	Refer to Installation and Maintenance Manual for the RM40A1 or A3 Data Mounting (Bulletin 5217 or 5243)					
<p>* The 500 or 2500 telephone with isolated hookswitch contacts can be used with cables 905-6611-01, -02, and 905-6592-01, -02 Series 1 and above only.</p> <p>† Includes lamp on cable switch assembly for data mode indication.</p> <p>‡ Application with RTC telephone is for Series 9 and above data modems only.</p> <p>§ 500 or 2500 telephone with isolated hookswitch contacts may be used in systems which are subject to excessive startup errors.</p>						

TABLE 2-B					
SPECIAL APPLICATIONS FOR PRIVATELY OWNED SYSTEMS OR APPLICATIONS WHICH DO NOT REQUIRE FCC REGISTRATION					
APPLICATION	TELEPHONE TYPE	AUXILIARY EQUIP. USED	TRANSMIT LEVEL APPLICATION	TEL. LINE INTERCONNECT CABLE	CONN. DIAG. FIG. NO.
Data with alternate voice	565, 2565, or ††AE186	None	Adjustable	*905-6414-01	2-23
				905-6414-04	2-24
Data with automatic answer only	None			*905-4962-01	2-25
				*905-4962-03	
Data with alternate voice and auto-answer inhibit	†565 or 2565			*905-6414-01	2-23
				905-6414-04	2-24

TABLE 2-B (Cont)

**SPECIAL APPLICATIONS FOR PRIVATELY OWNED SYSTEMS  
OR APPLICATIONS WHICH DO NOT REQUIRE FCC REGISTRATION**

APPLICATION	TELEPHONE TYPE	AUXILIARY EQUIP. USED	TRANSMIT LEVEL APPLICATION	TEL. LINE INTERCONNECT CABLE	CONN. DIAG. FIG. NO.
Data with automatic calling and alternate voice	**565, 2565 or ††AE186	801C L1/2	Adjustable	905-6630-01	2-26
				905-6630-04	2-29
			Fixed loss loop	905-6630-02	2-27
			Programmable	905-6630-03	2-28
			Permissive	905-6630-05	2-30
	565, 2565, or ††AE186	‡801A or 801C	Adjustable	*905-6414-01 ‡‡149B adapter and ‡‡D10P cable	2-31
Data with alternate voice for up to five individually housed data modems	§Modified 565 or 2565	Five-way adapter		905-6414-01 and B25A cable	2-32

\* Cable must be series 2 or higher.

† Telephone must be modified as per paragraph 5.02 of this section.

‡ 801A is normally used with rotary dial telephone and 801C is normally used with tone dial telephone.

§ Telephone must be modified as per paragraph 5.03 of this section.

\*\* Telephone may be removed in this application if no voice communication is required.

†† AE186 telephones must be modified per paragraph 5.05 of this section.

‡‡ Not supplied by Rixon Inc.

## B. Unpacking and Inspection

**1.03** Inspect the unit thoroughly after delivery. If the unit has been damaged in transit, please report it to the carrier and to Rixon Inc., Customer Engineering Department, at (301) 622-2121 or TWX 710-825-0071. Make an operational check after installation is complete. If necessary, verify that circuit card connectors are properly seated by following disassembly and reassembly instructions in paragraph 2.02 of this section. Ensure that the mounting cable is included with the data modem.

## C. Service Applications

**1.04** The T212A Data Modem has many applications including manual or automatic answering, compatibility with ACUs (801A6, 801C4, and 801C-L1/2), and multiple line installations. Typical FCC service applications are listed in Table 2-A. Special applications for privately owned systems or applications which do not require FCC registration are listed in Table 2-B.

**NOTE:** This data modem cannot be used with party lines or coin lines.

**1.05** The transmit line level of a T212A Data Modem is determined by an internal adjustable attenuator and by a resistance connected across programming pins 18 and 19. A series of different telephone interface cable assemblies allows the data modem to be applied to different level setting arrangements:

- Adjustable (by telephone company personnel only) uses cable with jumper between pins 18 and 19. Transmit level is set by internal attenuator.
- Fixed loss loop uses cable with 866 ohms resistance between pins 18 and 19. Transmit level is -4 dBm maximum.
- Permissive uses cable with 9310 ohms and resistance between pins 18 and 19. Transmit level maximum is -9 dBm.
- Programmable uses cable with leads from pins 18 and 19 to connect to resistance built into telephone company supplied interconnection point.

**NOTE:** When either fixed loss loop, permissive, or programmable level setting applications are used, the data modem internal attenuator must remain in factory set 0 dBm position. Doing otherwise adds additional attenuation to transmitted signals.

**1.06** Prior to installation, the telephone company must be notified of the intended installation. The Universal Service Order Code (USOC) numbers for the telephone service jacks are listed in Table 2-C. One of the codes must be specified for installation by the telephone company. The FCC registration number and ringer equivalence number (located on label on outside of data modem) must also be provided.

**NOTE:** This data modem (as of the date of manufacture) is compatible with telephone company communications facilities with which it was intended to operate. However, if the telephone company changes its communications facilities, equipment, operations, or procedures such that this equipment is no longer compatible, RIXON is not responsible for the cost of modification or replacement of the data modem.

TABLE 2-C				
NETWORK CONNECTION DESCRIPTIONS				
NETWORK CONNECTION DESCRIPTIONS	*USES USOC	†APPLICATIONS		
		PE	PR	FLL
Arrangements used without key systems.	RJ41S or RJ41M	X	X	X
	RJ45S or RJ45M	X	X	
	RJ11C	X		
Arrangements used with key systems where tip and ring are connected ahead of key systems line circuit.	RJ12C	X		
Arrangements used with key systems where tip and ring are connected behind key systems line circuit.	RJ13C	X		
*S - Single jack. M - Multiple jacks. C - Surface or flush mounted jacks for use with standalone modems and telephones. †PE - Permissive transmit level configuration. PR - Programmable transmit level configuration. FLL - Fixed loss loop transmit level configuration.				

## 2. OPTIONS

### A. Introduction

**2.01** Proper data site installation requires correct option selection in data modem and auxiliary equipment. The data modem is equipped with options that can be selected without test

equipment or tools other than a screwdriver. Option selection is determined by the servicing telephone company and customer. Table 2-D contains options to be selected by the telephone company, and Table 2-E contains options to be selected by the customer. Read the description of each option before attempting installation; many are interrelated.

**TABLE 2-D**  
**TELEPHONE COMPANY SELECTED OPTIONS**

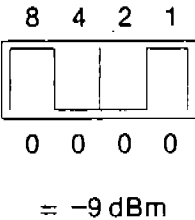
FEATURE	OPTION	GENERAL DESCRIPTION	WECO DESIG.	SWITCH OR JUMPER POSITION	LOCATION
Transmit Signal Range *0 to -15 dBm. When used in registered applications where the cable supplied with the modem determines the transmit level, set the attenuator position to 0.	*0 to -15 dBm	Option allows telephone company personnel to select transmitter levels between 0 and -15 dBm in 1 -dB steps if data modem is used in adjustable transmit level arrangements. For transmit level arrangements other than adjustable leave in *0 dBm position.	—		S201 on filter card
Tip-ring Make Busy	In	If data modem is made busy by CN circuit or front panel AL pushbutton, it is disconnected from the line and a resistor is connected between tip and ring. Primarily used when modem is operated behind line hunting equipment.	F	Jumper in MB position	Jumper on main card
	Out	If data modem is made busy by CN circuit or front panel AL pushbutton, it is disconnected from the line but a resistor is not connected between tip and ring.	*E	Jumper in $\overline{MB}$ position	

TABLE 2-D (Cont)					
TELEPHONE COMPANY SELECTED OPTIONS					
FEATURE	OPTION	GENERAL DESCRIPTION	WECO DESIG.	SWITCH OR JUMPER POSITION	LOCATION
Signal and Frame Ground	Common	Ties signal ground to the metal case (frame ground) of the data modem. Used to reduce longitudinal noise from the power line.	*Q	Screw switch closed	Rear panel
	Separate	Isolates signal ground from frame ground.	P	Screw switch open	
* Factory installed option.					

TABLE 2-E					
USER SELECTED OPTIONS					
FEATURE	OPTION	GENERAL DESCRIPTION	WECO DESIG.	SWITCH OR JUMPER POSITION	LOCATION
Transmitter Timing	INT	Data modem internal bit rate clock runs transmitter and is supplied to terminal at DB lead.	*YC	S7-1U, S7-2U	S7 on main card
	EXT	Transmitter clock is phase-locked to customer provided external source via DA lead.	YD	S7-1D, S7-2U	
	Slave	Transmitter clock is phase-locked to Receive Timing Element lead DD which is derived from received data. Used in multiplexing and other systems.	WI	S7-1U, S7-2D	
<b>NOTE:</b> <i>Transmitter timing options only affect high speed mode operation. YC must be selected for character-asynchronous operation.</i>					

TABLE 2-E (Cont)

## USER SELECTED OPTIONS

FEATURE	OPTION	GENERAL DESCRIPTION	WECO DESIG.	SWITCH OR JUMPER POSITION	LOCATION
Answer Mode Indication	CE ON	Data modem CE lead is on during ringing and data mode of answered calls. Used with terminals which need originated/answered call indication from data modems.	X	S7-4D	S7 on main card (cont)
	CE OFF	Data modem CE lead is on during ringing. Used with terminals which only need ring indication at beginning of calls.	*W	S7-4U	
Automatic Answer	In	If Data Terminal Ready indication CD is on data modem automatically answers incoming calls. Normally used to provide unattended answering.	*ZH	S8-1U	S8 on main card
	Out	Prevents automatic answering.	ZG	S8-1D	
Send Space Disconnect	In	Data modem transmits space signal for about 4 seconds before disconnecting. Used where remote site has option V or equivalent installed.	*T	S8-2D	
	Out	Data modem disconnects without automatically sending a long space.	U	S8-2U	



TABLE 2-E (Cont)					
USER SELECTED OPTIONS					
FEATURE	OPTION	GENERAL DESCRIPTION	WECO DESIG.	SWITCH OR JUMPER POSITION	LOCATION
Receive Space Disconnect	In	If continuous space is received for approximately 2 seconds data modem automatically disconnects from data line. Used where remote site has option T or equivalent installed.	*V	S8-3D	S8 on main card (cont)
	Out	Prevents automatic disconnect when long space is received	Y	S8-3U	
Loss of Carrier Disconnect	In	If carrier is interrupted for longer than 410 ms during data mode data modem disconnects from line.	*S	S8-4D	
	Out	Prevents automatic disconnect by carrier interruption.	R	S8-4U	
Receiver Responds to Remote Digital Loopback	In	Data modem is automatically placed in digital loopback by request from remote T212A Data Modem in high speed mode.	*YK	S9-1U	S9 on main card
	Out	Blocks automatic digital loopback testing.	YL	S9-1D	
CB and CF Indications	Common	Clear To Send interface lead is connected to follow operation of Carrier Detected interface lead CF.	*A	S9-4D	
	Separate	CB lead is not affected by CF in any way.	B	S9-4U	

TABLE 2-E (Cont)

## USER SELECTED OPTIONS

FEATURE	OPTION	GENERAL DESCRIPTION	WECO DESIG.	SWITCH OR JUMPER POSITION	LOCATION
CN and TM Interface Assignment	CN 25, TM NC	CN lead at pin 25, TM lead not connected.	*XO	S6-1U, S6-2U, S6-3D, S6-4U	S6 on main card
	CN 18, TM NC	CN lead at pin 18, TM lead not connected.	XN	S6-1U, S6-2U, S6-3U, S6-4D	
	CN 18, TM 25	CN lead at pin 18, TM lead at pin 25.	XR	S6-1D, S6-2U, S6-3U, S6-4D	
	CN 25, TM 18	CN lead at pin 25, TM lead at pin 18.	—	S6-1U, S6-2D, S6-3D, S6-4U	
Interface Control of RDL Lead	In	In high speed mode remote unattended T212A Data Modem is placed in digital loopback when RL lead is on during call origination.	XL	S6-5D	
	Out	Remote digital loopback initiation is not under terminal control. Only front panel RDL switch initiates remote digital loopback.	*XM	S6-5U	
Speed Control	Interface CH	Originating speed mode selection is determined by Data Rate Selector lead (CH) status (on for high speed and off for low speed).	XJ	S6-7D, S10-4U	S6 and S10 on main card
	HS Button	Front panel HS switch determines speed mode and CH lead is ignored.	*XK	S6-7U, S10-4D	
Interface Speed Indication CI	In	Speed Mode Indicator lead CI goes on only during high speed mode.	YQ	S6-6D	S6 on main card
	Out	CI lead is open at all times.	*YR	S6-6U	

TABLE 2-E (Cont)					
USER SELECTED OPTIONS					
FEATURE	OPTION	GENERAL DESCRIPTION	WECO DESIG.	SWITCH OR JUMPER POSITION	LOCATION
Speed Mode	High only	Prevents originating or answering low speed data calls.	YO	S10-1D	S10 on main card
	Dual	Utilizes full T212A operating capability.	*YP	S10-1U	
Interface Control MB/AL CN Lead	In	Make Busy/Analog Loopback circuit CN is activated when CN lead is on, open, or grounded. Terminal holds CN lead negative during normal operation. Activating CN circuit disconnects data modem from line. If tip and ring Make Busy is installed, activating CN circuit also makes line busy. If CD lead and CN circuit are on, data modem automatically goes into analog loopback test mode.	YE	S10-2U	
	Out	CN lead is ignored.	*YF	S10-2D	
CC Indication for Analog Loopback	On	Data Set Ready indication CC goes on during analog loopback test. Certain terminals require CC on to perform analog loopback.	*ZF	S10-3D	
	Off	CC only goes on when data modem is in data mode.	ZE	S10-3U	
1200 BPS Operation	Sync	1200 bps operating is in synchronous format.	YH	S6-8D, S6-9D, S9-3D	S6 and S9 on main card
	Async	1200 bps operation is in character asynchronous format and either YI or YJ must also be selected.	*YG	S6-8U, S6-9U, S9-3U	

TABLE 2-E (Cont)

## USER SELECTED OPTIONS

FEATURE		OPTION	GENERAL DESCRIPTION	WECO DESIG.	SWITCH OR JUMPER POSITION	LOCATION
Character Length (Use with YG)		9-bit	Nine-bit character length includes seven information, one start, and one stop bit.	YI	S9-2U	S9 on main card
		10-bit	Ten-bit character length includes eight information, one start, and one stop bit.  <b>NOTE:</b> When YG option is selected character length option YI and YJ must also be selected. System format determines appropriate setting.	*YJ	S9-2D	
†Telephone Set Used	Series 4 Through 8	500/565	Required in standard configurations which do not use RTC telephones.	*—	S7-3U	S7 on main card
		RTC	Only required in configurations which use RTC telephones.	—	S7-3D	
	Series 9 and Higher	500/565	Required in standard configurations which do not use RTC telephones.	*—	S11-2U, S11-3U, S11-4D	S11 on main card
		RTC	Only required in configurations which use RTC telephones.	—	S11-2D, S11-3D, S11-4U	
* Factory installed option † Provided on Series 4 and higher data modems only.						

**B. Data Modem Disassembly and Reassembly**

**2.02** It is necessary to remove data modem circuit cards from the standalone enclosure to inspect or install options. Use the following procedure:

**R  
E  
A  
D** Never use force while removing assembly from case, otherwise damage may result.

- (a) Using flat-blade screwdriver in access slot on bottom of bezel (shown in Fig. 2-1) pry card assembly from case. Loosen and disconnect assembly from rear housing connector.

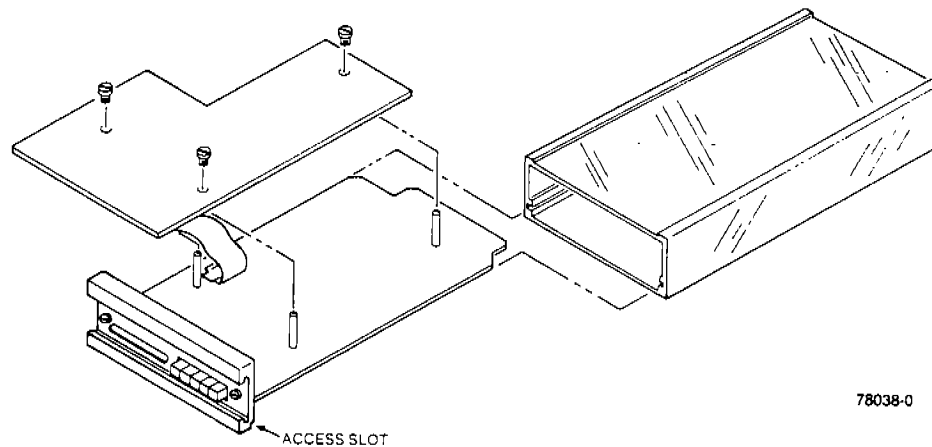
**R  
E  
A  
D** Handle assembly by front panel and edges of cards only. Static charges may damage ICs.

- (b) Slide assembly from case while gripping front panel. Set assembly on a nonconductive surface.

- (c) To gain access to options, remove three retaining screws holding filter card and move filter card aside.

**R  
E  
A  
D** Ensure that ribbon cable is bowed inward before inserting assembly in case otherwise ribbon cable and connectors may be damaged.

- (d) To reassemble data modem, reverse order of Steps a, b, and c.



**Fig. 2-1. Data Modem Disassembly**

C. Option Installation

Data Modem Options

2.03 After determining the correct option positions for the particular data installation, refer to Fig. 2-2 for option locations, and Table 2-D or 2-E for switch settings. To install selected options remove the data modem circuit card assembly from the enclosure. Open the card

assembly, locate appropriate switches, and set options to applicable positions.

ACU Options

2.04 The recommended 801 ACU options used with T212A Data Modems are listed in Table 2-F.

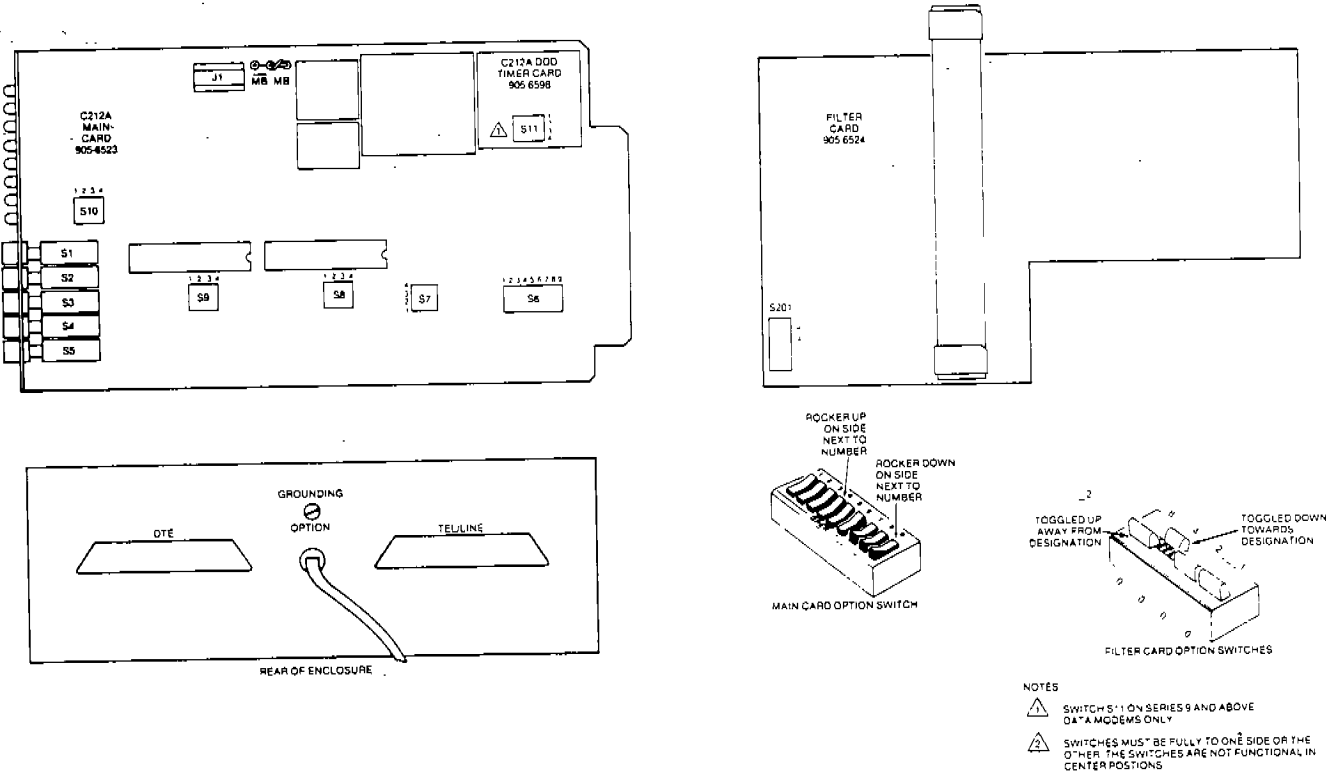


Fig. 2-2. Data Modem Option Locations

78042-2

### 3. CONNECTIONS

#### A. Location Requirements

**3.01** The data modem must be physically located within the length of customer supplied interface cable required to connect business machine to the data modem. Figure 2-3 provides the data modem dimensions required for installation.

**NOTE:** *This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. As temporarily permitted by regulation, it has not been tested for compliance with the limits for Class A computing devices pursuant to subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.*

#### B. Power Requirements

**3.02** A standard three-wire grounding power receptacle is required to provide ac power for the data modem. Refer to the specifications table in the Description and Operation section for the power specifications. This power receptacle should not be controlled by a switch.

**3.03** To avoid possible errors due to potential difference between grounds for the data modem and business machine, the power receptacles for the data modem and business machine must be served from the same ac distribution panel. When an 801 ACU is used with the data modem, business machine, data modem, and ACU grounds must all be served from the same ac distribution panel.

#### C. Business Machine Interface Requirements

**3.04** The interface cable must not be more than 50 ft long. It must be equipped with a 25-pin Cinch or Cannon connector (DB25P-C33 connector with DB-51226-1 hood or equivalent) to mate with the data modem connector. Table 2-G identifies and describes the signals on the interface connector pins. Unused pins are not shown.

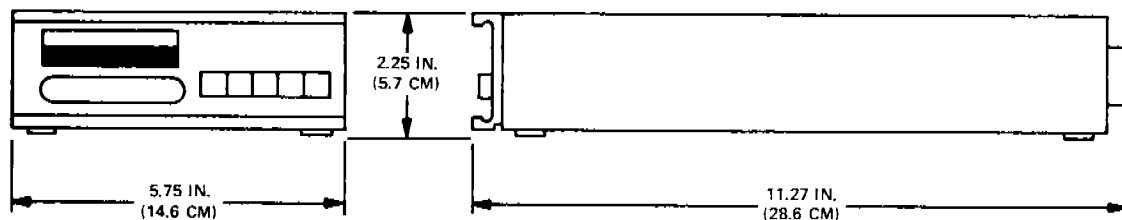
TABLE 2-F

## 801 ACU OPTIONS USED WITH T212A DATA MODEM

OPTION DESCRIPTION	OPTION DESIGNATIONS			REQUIREMENT
	801C L1/2	801A6	801C4	
Mounting cord 13-conductor	*M13G	†	†	Use only specified options
Mounting cord 10-conductor	†	M	M	
ACU answer detection or end of number code	B	B	B	
Detect beginning of answer tone	X	X	X	
Detect 2225-Hz answer tone	T	T	T	
DLO controlled by ACU	*	*	ZM	
Data modem to data mode by grounded contact	ZG	ZG	ZG	
Isolated TK contact	ZA out	ZB	ZB	
Clear signal to data modem	ZP	†	†	
Two-wire operation	*	*	ZH	
Ground start (two-wire)	V	*	V	Telco selects one
Loop start	Y	†	Y	
Short loop (under 400 ohms)	†	ZU out	†	Telco selects one
Long loop (over 400 ohms)	†	ZU in	†	
Stop ACR timer when DSS goes ON	R	R	R	Customer selects one
Do not stop ACR timer when DSS goes ON	H	H	H	
Terminate call via data modem after DSS goes ON (line transfer in test)	G	G Not used	G Not used	Customer selects one
Terminate call via CRQ after DSS ON (line transfer)	Z	Z Not used	Z Not used	



TABLE 2-F (Cont)				
801 ACU OPTIONS USED WITH T212A DATA MODEM				
OPTION DESCRIPTION	OPTION DESIGNATIONS			REQUIREMENT
	801C L1/2	801A6	801C4	
7-second ACR timing	ZQ	Screwdriver adjust		Customer selects one
14-second ACR timing	ZR			
28-second ACR timing	ZS			
56-second ACR timing	ZT			
Terminal contact interface	†	ZE	†	Customer selects one
Terminal voltage interface	*	ZF	*	
SG connected to FG	ZU	Strap in		Customer selects one
SG not connected to FG	ZV	Strap out		
* Factory wired. † Not available.				



78040-0

Fig. 2-3. Installation Dimensions

#### D. Telephone Interface Requirements

**3.05** The telephone interface cable requires a 15-conductor cable terminated in a connector to mate with the 565 telephone. Table 2-H identifies and describes the signals on the pins of the

data modem telephone connector. Unused pins are not shown. Table 2-I lists resistor  $R_p$  values to be connected between pins 18 and 19 of the telephone interface connector for programmed transmit levels.

**TABLE 2-G**  
**CUSTOMER INTERFACE CONNECTOR SIGNALS**

*CUST. INT CONN. PIN NUMBER (RS232C DESIG.)	CARD EDGE CONN. DESIG.	† SIGNAL TYPE	SIGNAL FROM	DESCRIPTION
1 (AA)	B	Ground	—	Protective Ground which is electrically bonded to equipment frame and external grounds through power cord.
2 (BA)	C	Data	Terminal	Transmitted Data to be modulated for transmission over telephone lines to remote site.
3 (BB)	D	Data	Data modem	Received Data which has been demodulated in response to signals received from remote site.
5 (CB)	F	Control	Data modem	Clear To Send lead is on when data modem is ready to transmit data. When CB-CF indication option is set to common, CB is clamped off when CF goes off.
6 (CC)	H	Control	Data modem	Data Set Ready lead is on when data modem is in data mode, or optionally in analog loopback mode.
7 (AB)	J	Ground	—	Signal Ground establishes common ground reference potential for all interface circuits except protective ground. It is optionally connected to protective ground to minimize introduction of longitudinal power line noise.
8 (CF)	K	Control	Data modem	Carrier Detected or Received Line Signal Detector lights when carrier is detected by data modem.
9 (+ P)	8	Test point	Data modem	Voltage test point is reserved for data modem testing. Limited current capabilities dictate that + P be used only for testing purposes.
10 (-P)	7	Test point	Data modem	Voltage test point is reserved for data modem testing. Limited current capabilities dictate that -P be used only for testing purposes.
11 (RL)	11	Control	Terminal	Remote Loopback is connected to pin 19 on Series 0 through 4, and pins 19 and 21 on Series 5 and up standalone enclosures.
12 (CI)	5	Control	Data modem	Speed Mode indicator lights when data modem is in high speed mode and goes out when data modem is in low speed mode.

TABLE 2-G (Cont)

## CUSTOMER INTERFACE CONNECTOR SIGNALS

*CUST. INT CONN. PIN NUMBER (RS232C DESIG.)	CARD EDGE CONN. DESIG.	† SIGNAL TYPE	SIGNAL FROM	DESCRIPTION
15 (DB)	M	Clock	Data modem	Transmission Signal Element Timing is a bit rate signal used to clock data into transmitter while in synchronous high speed mode. Transmitter timing options YC, YD, and WI determine source of signal. Lead is disconnected when data modem is optioned for asynchronous high speed operation.
17 (DD)	L	Clock	Data modem	Receiver Signal Element Timing is a bit rate signal used for synchronization of received data while in synchronous high speed data mode. Sampling should be done on negative transition of DD. Normal frequency for DD during synchronous high speed data mode is 1200 Hz (+ 0.01 percent). In low speed data or idle modes frequency for DD clock is 1181 Hz through 1219 Hz. When data modem is optioned for asynchronous high speed operation lead is disconnected.
‡18 (TM)	6	Indication	Data modem	Test Mode indicator lights when data modem has been put into test mode. Data modem may be put into test mode either manually, through interface, or remotely.
19 (RL)	2	Control	Terminal	Remote Loopback is connected to terminal when Cust. Int. control of RDL option is in yes position. If terminal sets lead to on and data modem is in originating high speed mode, RDL circuits are preconditioned to signal answering remote data modem to go into digital loopback test mode. When remote digital loopback is established data modem front panel lamp TM lights. Refer to 300 section for remote digital loopback restrictions.
20 (CD)	3	Control	Terminal	Data Terminal Ready lead is set to on by terminal when it is ready to transmit and receive data. CD on permits data modem to be connected to data line upon auto-answer or talk-to-data transfer, unless CN circuitry is activated. (Refer to CN lead description.)
21 (RL)	2	Control	Terminal	Remote Loopback is connected to pin 19 on Series 5 and up standalone enclosures.

TABLE 2-G (Cont)

## CUSTOMER INTERFACE CONNECTOR SIGNALS

*CUST. INT CONN. PIN NUMBER (RS232C DESIG.)	CARD EDGE CONN. DESIG.	† SIGNAL TYPE	SIGNAL FROM	DESCRIPTION
22 (CE)	4	Control	Data modem	Ring Indicator is on when ringing signal has been detected. Indicator permits automatic answer of incoming calls. CE may be optioned to remain on during data mode of received calls to act as answer mode indicator.
23 (CH)	9	Control	Terminal	Data Signal Rate Selector is connected to data modem when data rate control option is in Cust. Int. position. When terminal sets control to on an unattended originating data modem automatically goes into high speed mode of operation.
24 (DA)	10	Clock	Terminal	Transmit Signal Element Timing is connected to data modem when external transmitter timing option YD is installed. DA is used during synchronous high speed mode. Transmitted data is synchronized with customer supplied 1200 Hz (+0.01 percent) bit rate clock. Data transitions must occur on positive transitions of bit rate clock.
‡25 (CN)	1	Control	Terminal	When YE option is installed CN circuit is available to interface. Make Busy/Analog Loop-back circuit CN is activated by terminal applying on condition or by CN being open or grounded. Activating CN circuit disconnects data modem from line. If tip and ring Make Busy option (MB) is installed activating CN circuit also makes line busy. If CD lead is on while CN circuit is on data modem automatically goes into analog loopback test mode. CN is ignored when front panel DL pushbutton is pressed and when option YF is installed.

\* Unused pins not shown.

† Control, clock and indicator signals: ON = +3 to +25 V; OFF = -3 to -25 V.

Data signals: binary 0 = space = +3 to +25 V; binary 1 = mark = -3 to -25 V.

‡ Refer to Table 2-D for descriptions of optional CN and TM lead placement.

TABLE 2-H			
TELEPHONE INTERFACE CONNECTOR SIGNALS			
TEL. INT. CONN. PIN. NO.	DESIG.	CARD EDGE CONN. DESIG.	DESCRIPTION
1	L	W	Data modem provides -V through 100 ohms during ringing and data mode. Used to control LINE lamp in associated telephone.
2	MB1	R	Data modem provides contact closure to MB when in make busy condition. Indication is used in second pair make busy arrangements and connected to network through multiple data modem mountings. For further information refer to applicable data mounting Installation and Maintenance Manual.
3	MB	21	See pin 2.
4	LG	16	Connected to ground in data modem. Lead provides return path for LINE lamp in associated telephone.
5	TD	S	Telephone provides contact closure from TD to TDG. Ground indicates that associated telephone is in talk mode and open allows data modem to enter data mode.
7	T	Y	Telephone line tip lead. Data and voice signals are transmitted and received through tip and ring leads. Telephone ringer is also connected across tip and ring.
8	R	X	Telephone line ring lead.
12	RNG	20	Ring detector indicator is used in multiple individually housed data modem configurations to provide contact closure from ground to telephone buzzer circuit.
14	C	T	Data mode indicator provides contact closure from ground to ACU during data mode.
16	D1	U	Data mode control is input from external equipment (ACU). Momentary contact closure to ground places data modem in data mode if Terminal Ready lead (CD) is on.
18	PR	22	Resistor (Rp) connected between PR and PC leads provides input to programming circuitry for programmable transmit level arrangements.
19	PC	Z	See pin 18.

TABLE 2-H (Cont)			
TELEPHONE INTERFACE CONNECTOR SIGNALS			
TEL. INT. CONN. PIN. NO.	DESIG.	CARD EDGE CONN. DESIG.	DESCRIPTION
21	T1	15	T1 and R1 leads extending from tip and ring to interconnect with telephone network allow alternate voice operation. Pins 8 (R) and 22 (R1) are connected in data modem.
22	R1	14	See pin 21.
23	A	18	Data modem provides contact closure between A and A1 to indicate that data modem or associated telephone is holding line. Leads are open at all other times. Indication is provided for KTU or ACU equipment.
24	A1	19	See pin 23.
25	TDG	17	Talk-Data control grounds is connected to ground in data modem. See pin 5.

#### E. Data Line Requirements

**3.06** To avoid interference during data transmission, use only individual data (telephone) lines and do not connect extension telephones. To minimize inductive interference to the data signals, data lines should not be carried in the same cable run with cables between data modems and business machines or with lines connected to dc teletypewriter services. If this requirement cannot be met, run data lines in shielded (SK) station wire between the data modem and cable distribution terminal or building entrance. The shield should be terminated on one end only, preferably the distribution terminal end.

#### 4. MULTIPLE INDIVIDUALLY HOUSED DATA MODEM INSTALLATIONS

**4.01** Up to five individually housed data modems can utilize up to five data channels through a single 565 telephone. Figure 2-4 shows a block diagram of the configuration. The controlling telephone is modified by adding a buzzer as described in paragraph 5.03 of this section. Operation of data modems and telephone are identical to single line installations with the exception of a telephone buzzer instead of ringer.

**4.02** A detailed wiring diagram of the multiple individually housed data modem installation is provided in Part 8 of this section. Part 8

<b>TABLE 2-I</b> <b>PROGRAMMING RESISTOR Rp VALUES</b> <b>Vs. TRANSMIT LEVEL IN</b> <b>PROGRAMMABLE APPLICATIONS</b>		
<b>TRANS LEVEL (dBm)</b>	<b>Rp VALUE (OHMS)</b>	<b>LOOP LOSS RANGE (dBm)</b>
0	Short	12 or more
-1	150	11-12
-2	336	10-11
-3	562	9-10
-4	866	8-9
-5	1,240	7-8
-6	1,780	6-7
-7	2,520	5-6
-8	3,610	4-5
-9	5,490	3-4
-10	9,200	2-3
-11	19,800	1-2
-12	Open	0-1

contains schematic diagrams of an unmodified 565 telephone set and a five-way adapter.

**4.03** Up to eight C212A L1 Data Modems may be housed in a single multiple data mounting. More information on multiple data modem installations is available in the appropriate data mounting Installation and Maintenance Manual.

## 5. TELEPHONE MODIFICATIONS

**5.01** In some applications it may be necessary to modify the 565 or AE186 telephone. The following procedures are for modifications which are referenced in Table 2-A and connection diagrams. Figure 2-5 may be used for terminal locations in the 565 telephones.

### A. Auto-Answer Inhibit Modification

**5.02** When automatic answer is required the data modem is normally optioned for permanent automatic answer. However, the telephone can be modified to provide auto-answer inhibit in single line applications. Modify the telephone as follows:

- Remove telephone cover by removing two slotted screws in front and rear of baseplate.
- Disconnect orange-white lead from terminal 1B (see Fig. 2-5) and connect to terminal N.
- Reinstall dial assembly and telephone cover.
- Mark base of telephone MODIFIED FOR T201C/T202S/T212A AUTO-ANSWER INHIBIT.
- Verify proper data modem automatic answer option is installed.

### B. Telephone Buzzer Installation

**5.03** A buzzer (RIXON part number 112-0005) is added to 565 telephones for multiple line configurations. The ringer in the telephone does not function correctly when used with five lines. When using telephones other than RIXON 385-0565-044 or 385-2565-044 see manufacturers instructions for installing buzzer. Install the buzzer inside the telephone as follows:

- Remove telephone cover by removing two slotted screws in front and rear of baseplate.
- Remove dial assembly by loosening two slotted screws, one on each side of dial assembly. Lift dial assembly up and to one side of dial assembly brackets.
- Note and record color coding on all wires going to six LG terminals (6 of 8 terminals in first row) on key assembly in case they loosen during following steps.

(d) If no bus bar is present go to step e. If a bus bar is present, remove screws in six LG terminals. Remove bus bar interconnecting all LG terminals and replace screws.

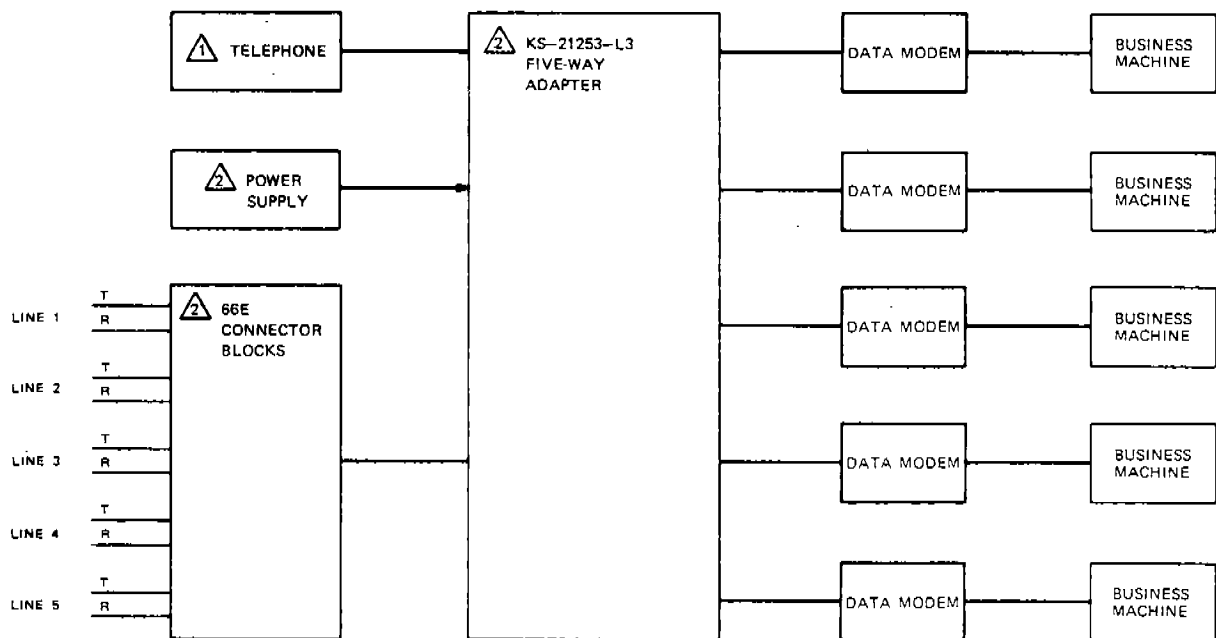
(e) Connect buzzer leads to terminals LH and LG (first two terminals in first row on left-hand side).

(f) Place dial assembly in dial assembly brackets and tighten screw on right-hand side only.

(g) Mount buzzer under screw on left-hand side of dial assembly. Buzzer should extend back toward rear of telephone. Tighten screw.

**R  
E  
A  
D** Added telephone wiring must not interfere with operation of hookswitch or any other mechanical parts.

(h) Place telephone cover on telephone and install two screws in baseplate.



NOTES.

△1 MODIFIED FOR BUZZER ADDITION

△2 TELCO PROVIDED EQUIPMENT.

75023-0

**Fig. 2-4. Multiple Individually Housed Data Modem Installation Block Diagram**



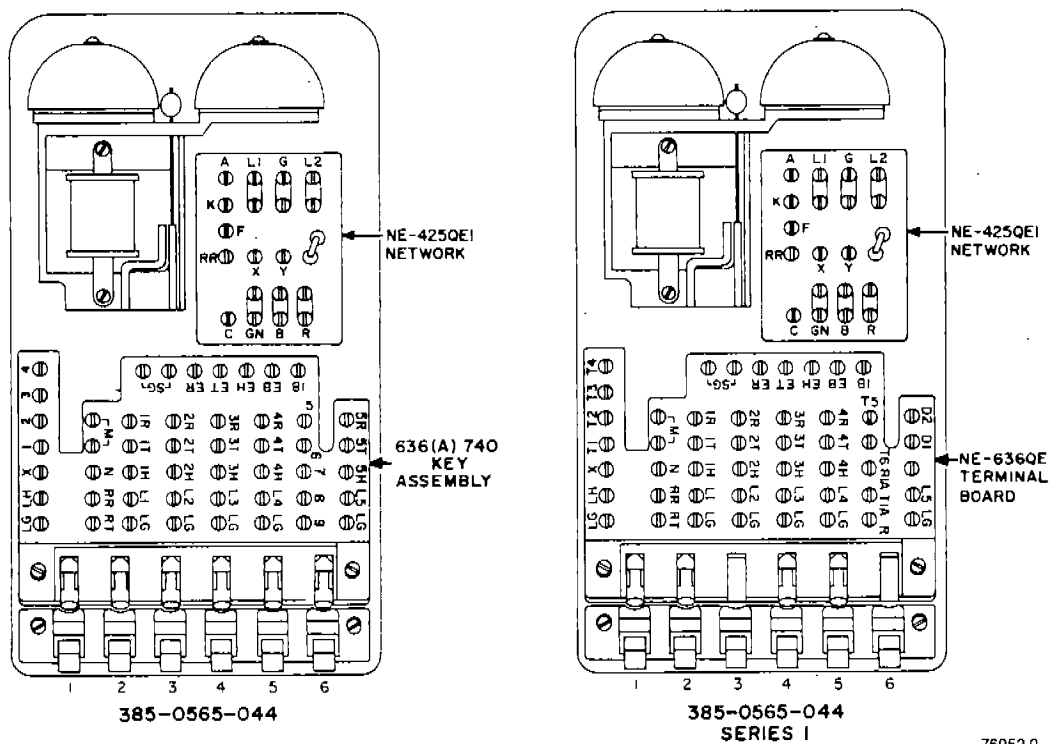


Fig. 2-5. Telephone Terminal Locations

### C. Exclusion Key Removal Modification

**5.04** When an exclusion key is incorporated in a 565 or 2565 telephone, the telephone must be modified as follows:

- Remove telephone cover by removing two slotted screws in front and rear of baseplate.
- Remove dial assembly by loosening two slotted screws, one on each side of dial assembly. Lift dial assembly up to one side of dial assembly brackets.
- Disconnect black-white lead from terminal 1H, tape and store.
- Reinstall dial assembly and telephone cover.
- Exclusion key is now nonfunctional. Operation of modified telephone is the same as described in paragraph 5.25 of the 100 section in this manual.

### D. Modification of AE186 Telephone for Operation with T212A Data Modem

**5.05** When using an AE186 telephone (model number prefixed HC) equipped with Light Emitting Diodes (LEDs) the telephone must be modified to prevent the T212A from reverse biasing the LEDs. The telephone is modified as follows:

- Remove telephone cover by removing the two slotted screws at the front of the baseplate and one slotted at the rear of the baseplate.
- Locate terminals 1L, 1G, through 6L, 6G on the telephone terminal board. Starting with 1L, 1G loosen each pair of L and G terminal screws and move the color coded leads as follows:
  - White-Green from terminal 1G to 1L.
  - Green-White from terminal 1L to 1G.

- Red-Blue from terminal 2G to 2L.
- Blue-Red from terminal 2L to 2G.
- Red-Brown from terminal 3G to 3L.
- Brown-Red from terminal 3L to 3G.
- Black-Orange from terminal 4G to 4L.
- Orange-Black from terminal 4L to 4G.
- Black-Slate from terminal 5G to 5L.
- Slate-Black from terminal 5L to 5G.
- Yellow-Green from terminal 6G to 6L.
- Green-Yellow from terminal 6L to 6G.

- (c) Place telephone cover on telephone and install three screws in baseplate.

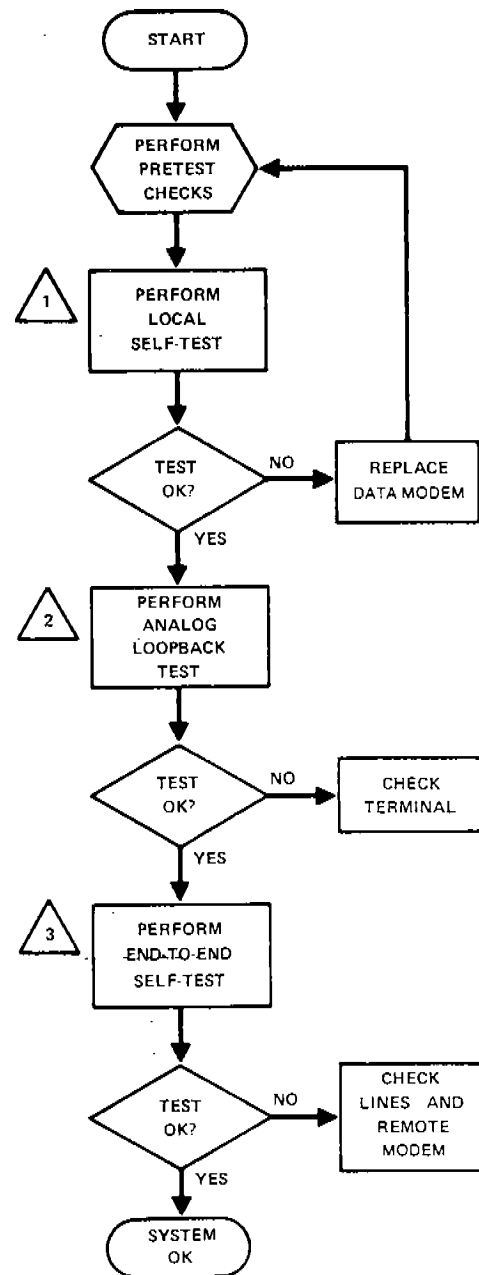
## 6. INSTALLATION TEST

**6.01** The T212A Data Modem is equipped with a number of features which aid in identification of system problems. Figure 2-6 provides a system checkout diagram which uses self-diagnostic features of the data modem. External test equipment is not required for the test listed in Fig. 2-6. Refer to the 300 section of this manual for test procedures.

## 7. REPAIRING DATA MODEM

**NOTE:** *This data modem can be repaired only by RIXON or one of its authorized agents. On modems using a main power fuse, customer replacement of the power fuse with one of the same type and rating is authorized.*

**7.01** If it becomes necessary to return the data modem to RIXON for repair or any other reason, contact Rixon Inc., Customer Engineering Department, 2120 Industrial Parkway, Silver Spring, MD 20904. However, do not return the unit unless specifically directed to do so by Customer Engineering. At that time a Return Goods Authorization (RGA) number is assigned to the unit. This number must appear on the outside shipping con-



### NOTES:

- 1 REFER TO PART 2 OF 300 SECTION.
- 2 REFER TO PART 3 OF 300 SECTION.
- 3 REFER TO PART 4 OF 300 SECTION.

78022-0

**Fig. 2-6. Installation Test Sequence**

tainer for proper identification and routing. It must also be referenced in any inquiries or correspondence about the unit.

**NOTE:** *If there are any problems with the data modem or a malfunction is suspected, immediately disconnect the data modem from the communications facility. Do not reconnect the data modem to the communications facility until the malfunction is corrected or it is determined that the data modem is operating properly. The telephone company can, at its option, discontinue service to a malfunctioning data modem if the data modem is causing harm to the telephone network. Once the malfunction is corrected service can be restored.*

## 8. REFERENCES

8.01 The following publications provide additional information for standalone and multiple installations using T212A Data Modems.

SECTION	TITLE
5454-100	T212A Data Modem Description and Operation
5454-300	T212A Data Modem Self-Diagnostics
5454-500	T212A Data Modem Tests Using External Test Equipment
5473	T212A Users Manual
5492	T212A Maintenance Manual

## 9. CONNECTION DIAGRAMS

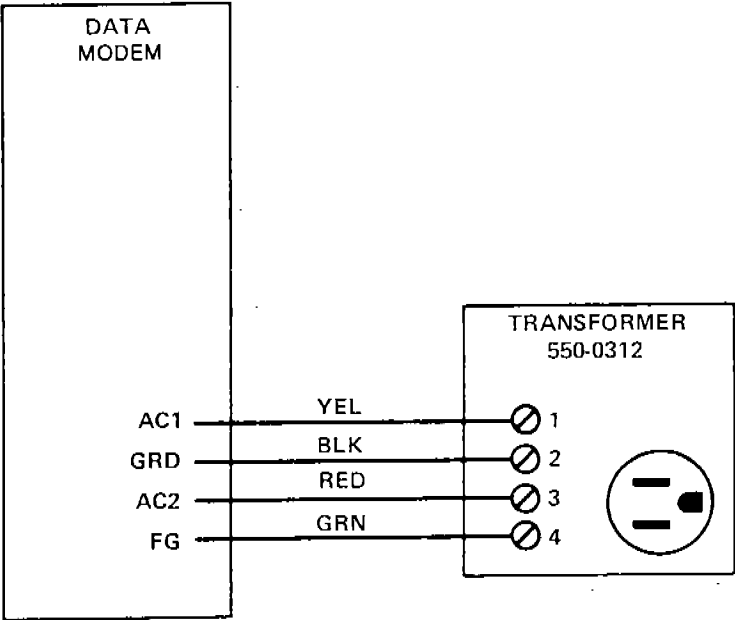
9.01 This part contains the connection diagrams for the T212A Series Data Modem. Applicable schematic diagrams are also provided. The following is a list of diagrams included in part 9.

### FIG. NO.

### FIGURE CAPTION

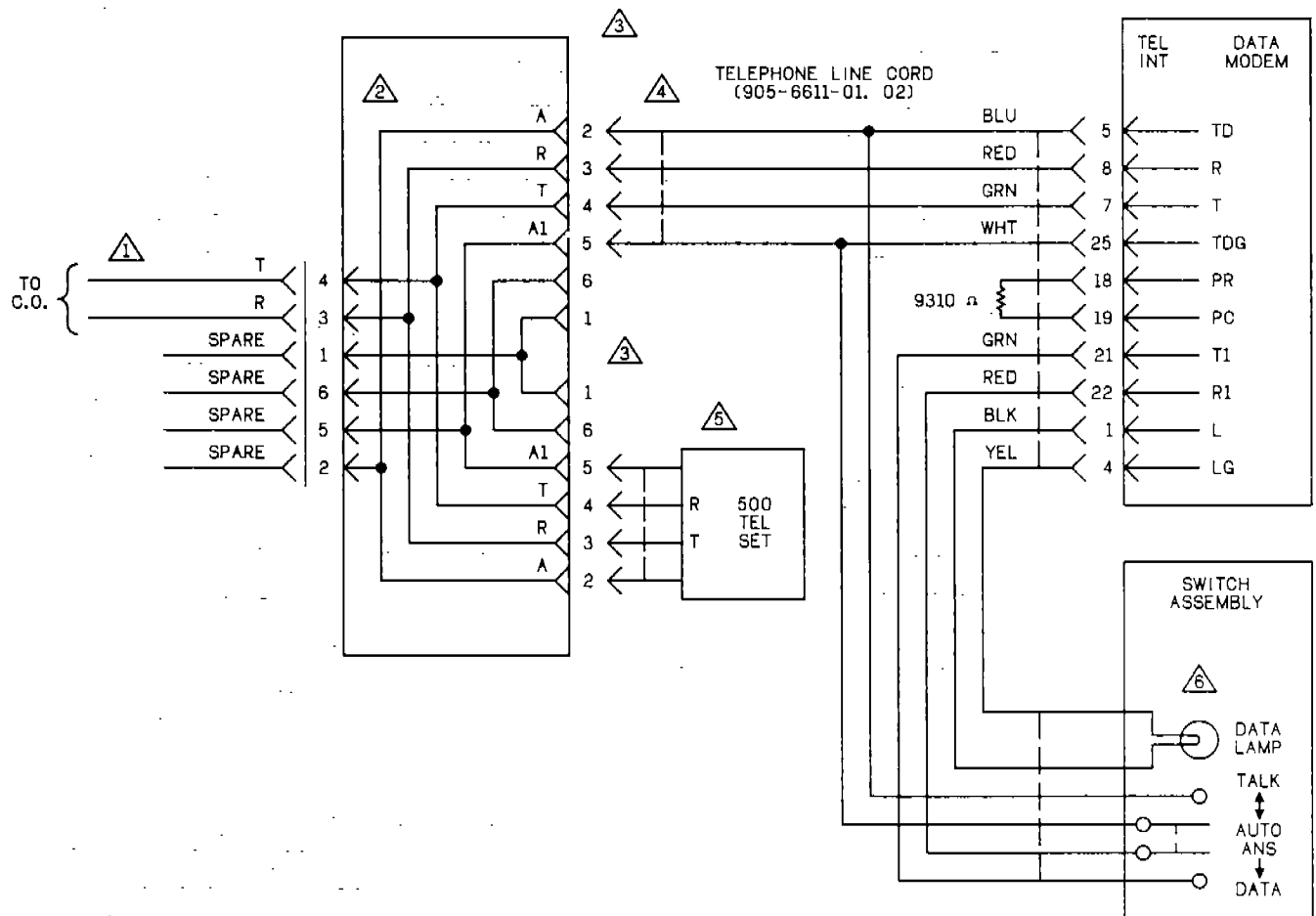
2-7	Data Modem Power Connection
2-8	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6611-01 or -02 Telephone Cord for Permissive Applications
2-8A	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6675-01 Telephone Cord for Permissive Applications
2-9	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6592-01 Telephone Cord for Programmable Applications
2-10	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6592-02 Telephone Cord for Fixed Loss Loop Applications
2-11	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6608-02 Telephone Cord for Fixed Loss Loop Applications
2-12	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6608-01 Telephone Cord for Programmable Applications
2-13	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6609-01 or -02 Telephone Cord for Permissive Applications
2-14	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6557-02 Telephone Cord for Fixed Loss Loop Applications

FIG. NO.	FIGURE CAPTION (Cont)	FIG. NO.	FIGURE CAPTION (Cont)
2-15	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6557-01 Telephone Cord for Programmable Applications	2-25	T212A Interconnection to DDD Network Using 905-4962-01 and -03 Telephone Cord for Adjustable Applications in Automatic Answer Only Operation
2-16	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6557-03 Telephone Cord for Permissive Applications	2-26	T212A, Telephone, and 801C L1/2 ACU Interconnection to DDD Network Using 905-6630-01 Telephone Cord for Adjustable Applications
2-17	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6414-05 Telephone Cord for Permissive Applications	2-27	T212A, Telephone, and 801C L1/2 ACU Interconnection to DDD Network Using 905-6630-02 Telephone Cord for Fixed Loss Loop Applications
2-18	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6414-03 Telephone Cord for Programmable Applications	2-28	T212A, Telephone, and 801C L1/2 ACU Interconnection to DDD Network Using 905-6630-03 Telephone Cord for Programmable Applications
2-19	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6414-02 Telephone Cord for Fixed Loss Loop Applications	2-29	T212A, Telephone, and 801C L1/2 ACU Interconnection to DDD Network Using 905-6630-04 Telephone Cord for Adjustable Applications
2-20	T212A Interconnection to DDD Network Via Telco Jack Using 905-6557-03 Telephone Cord for Permissive Applications in Automatic Answer Only Operation	2-30	T212A, Telephone, and 801C L1/2 ACU Interconnection to DDD Network Using 905-6630-05 Telephone Cord for Permissive Applications
2-21	T212A Interconnection to DDD Network Via Telco Jack Using 905-6557-02 Telephone Cord for Fixed Loss Loop Applications in Automatic Answer Only Operation	2-31	T212A, Telephone, and ACU Interconnection to DDD Network Using 149B Adapter
2-22	T212A Interconnection to DDD Network Via Telco Jack Using 905-6557-01 Telephone Cord for Programmable Applications in Automatic Answer Only Operation	2-32	Multiple Individually Housed T212A, Telephone, and Five-Way Adapter Interconnection to DDD Network
2-23	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6414-01 Telephone Cord for Adjustable Applications	2-33	Five-Way Adapter (KS-21253-L3) Schematic Diagram
2-24	T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6414-04 Telephone Cord for Adjustable Applications	2-34	500 Telephone Schematic Diagram
		2-35	565 Telephone Schematic Diagram
		2-36	AE186 (HC8666000ASL) Telephone Schematic Diagram




77051-0

Fig. 2-7. Data Modem Power Connection



NOTES:

-  CONNECTION CONFIGURATION USOC  
FOR AVAILABLE JACKS:

SINGLE	MULTIPLE	OTHER
RJ41S	RJ41M	RJ11C
RJ45S	RJ45M	RJ12C
		RJ13C

RJ12C AND RJ13C ON SERIES 0  
CABLE ONLY.

- 2 RJ2AX ADAPTER SUPPLIED WITH  
905-6611-01. 02 CABLE.

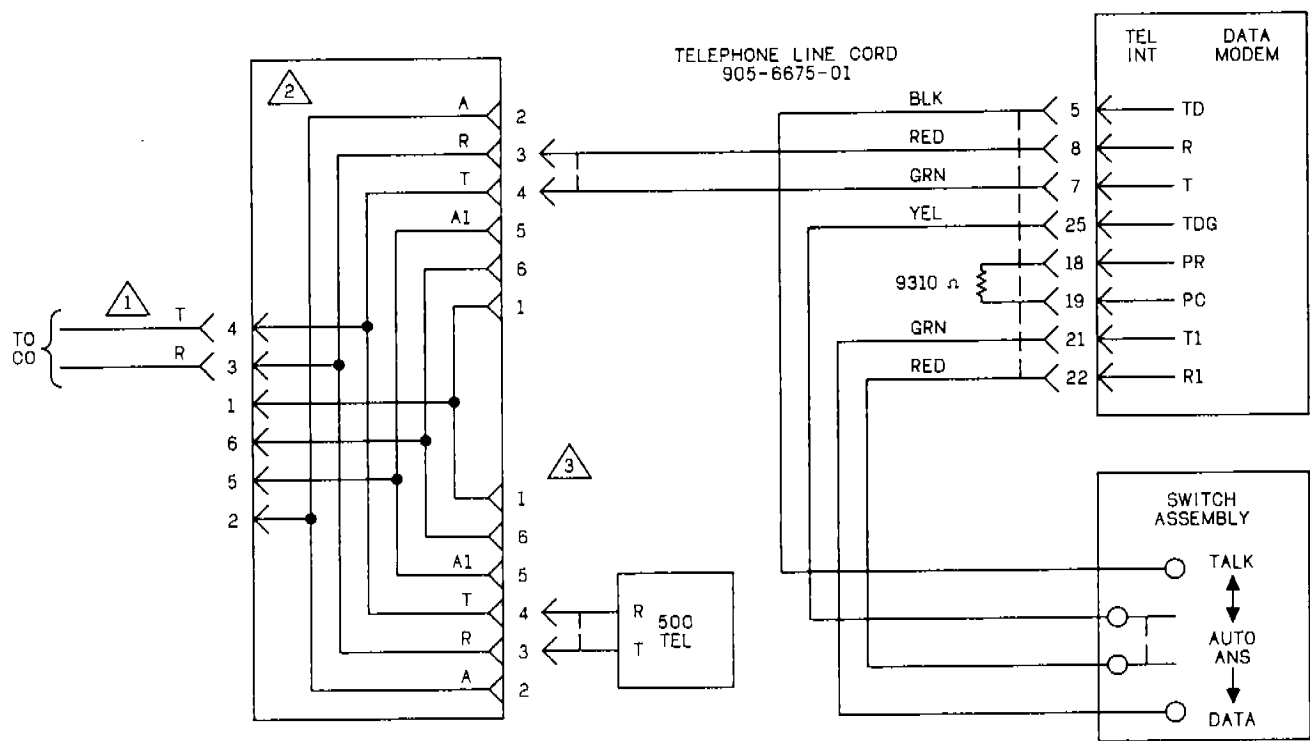
- △<sub>3</sub> SIX POSITION MODULAR PLUG.

- △ PINS 2 AND 5 ON SERIES 1 AND ABOVE CABLE ONLY.

- 5 A AND A1 LEADS AT PINS 2 AND 5 ON  
500 TELEPHONE WITH ISOLATED  
HOOKSWITCH CONTACTS ONLY.

- △ 6 LAMP PROVIDED WITH 905-6611-02 ONLY.

**Fig. 2-8. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6611-01 or -02 Telephone Cord for Permissive Applications**



NOTES:

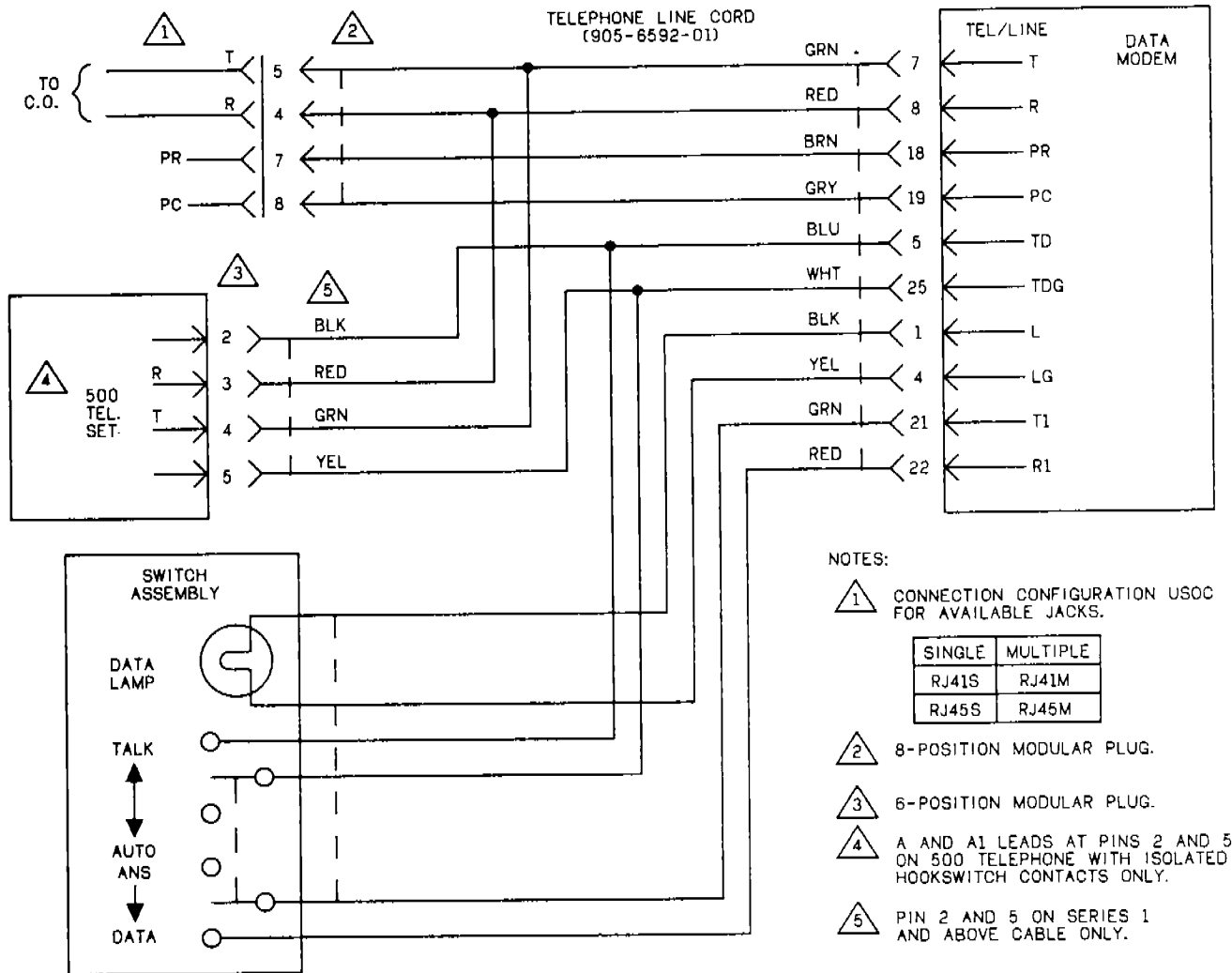
1 CONNECTION CONFIGURATION USOC FOR AVAILABLE JACKS:

SINGLE	MULTIPLE	OTHER
RJ41S	RJ41M	RJ11C
RJ45S	RJ45M	RJ12C
		RJ13C

- 2 RJ42X ADAPTER SUPPLIED WITH CABLE.
- 3 SIX POSITION MODULAR PLUG.

80245-1

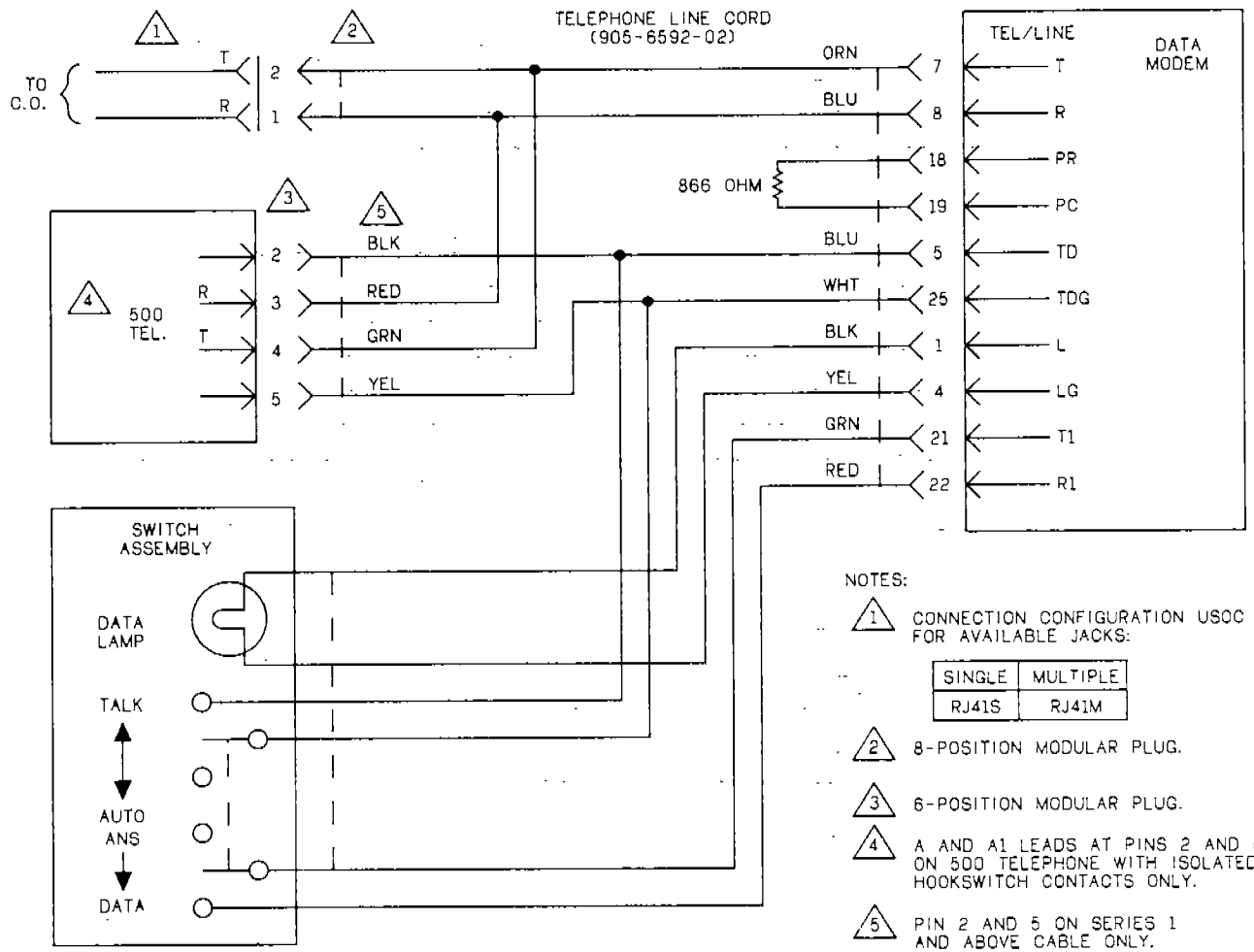
**Fig. 2-8A. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6675-01 Telephone Cord for Permissive Applications**



79168-1

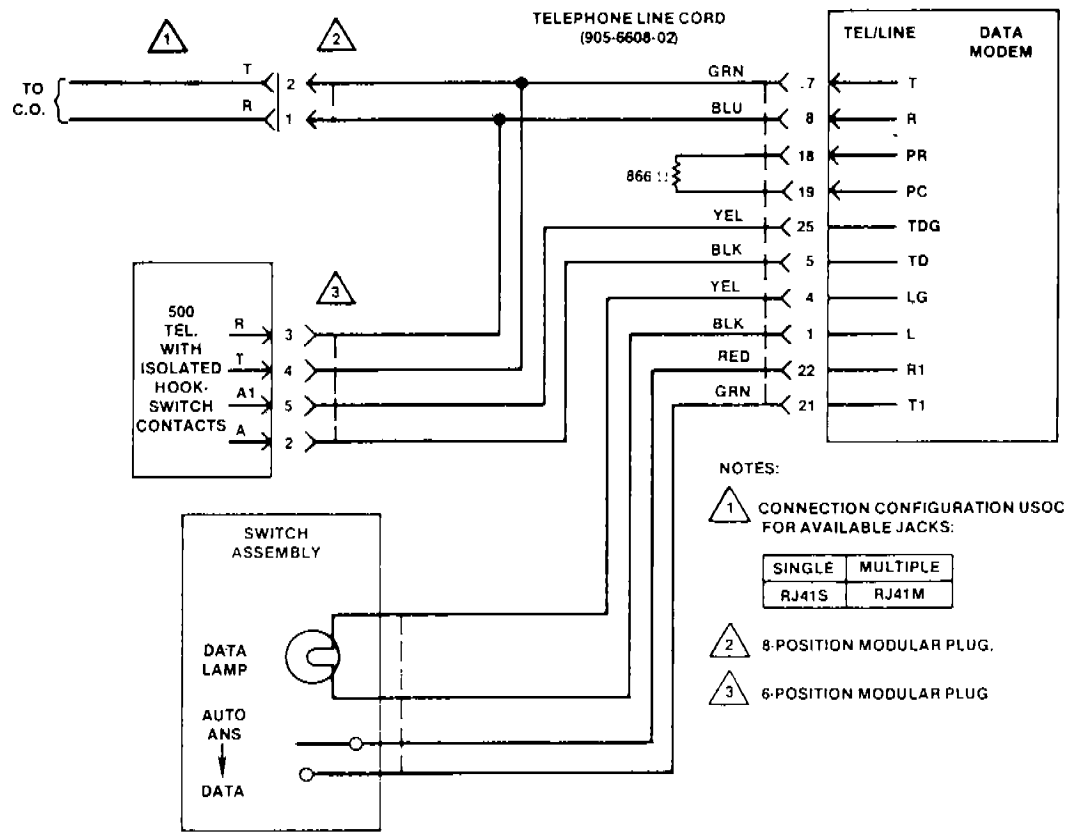
**Fig. 2-9. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6592-01 Telephone Cord for Programmable Applications**





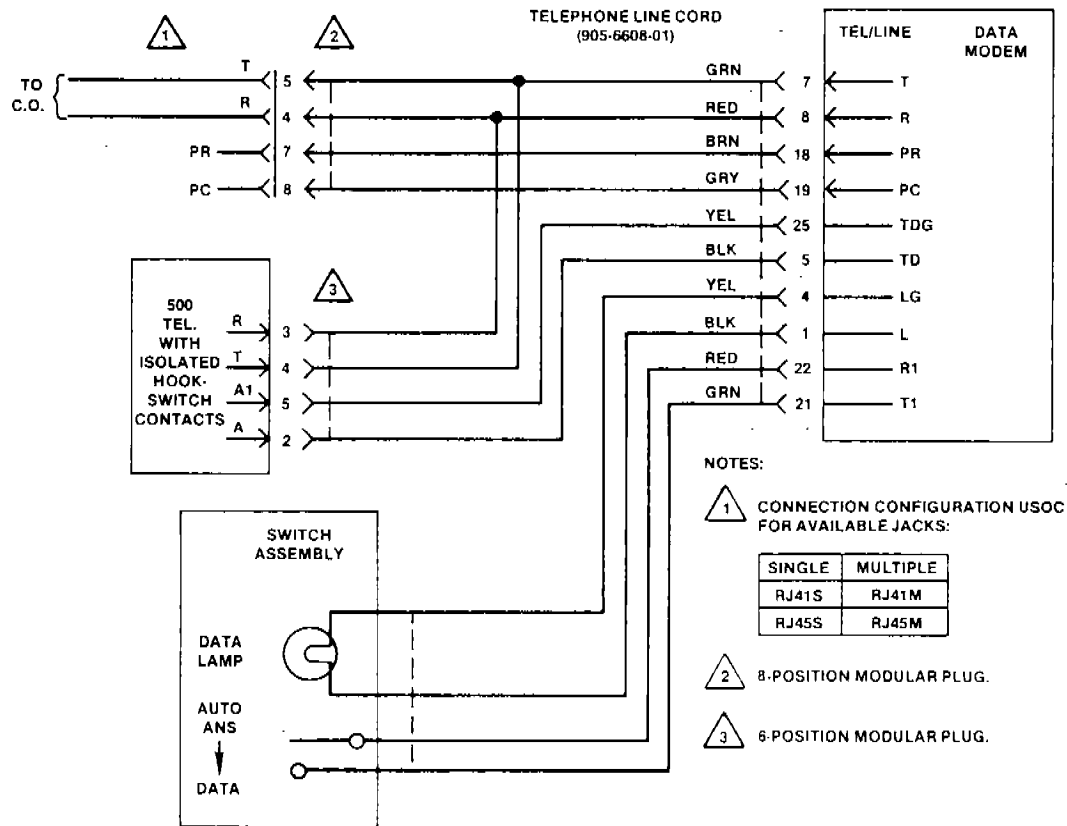
79202-1

**Fig. 2-10. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6592-02 Telephone Cord for Fixed Loss Loop Applications**



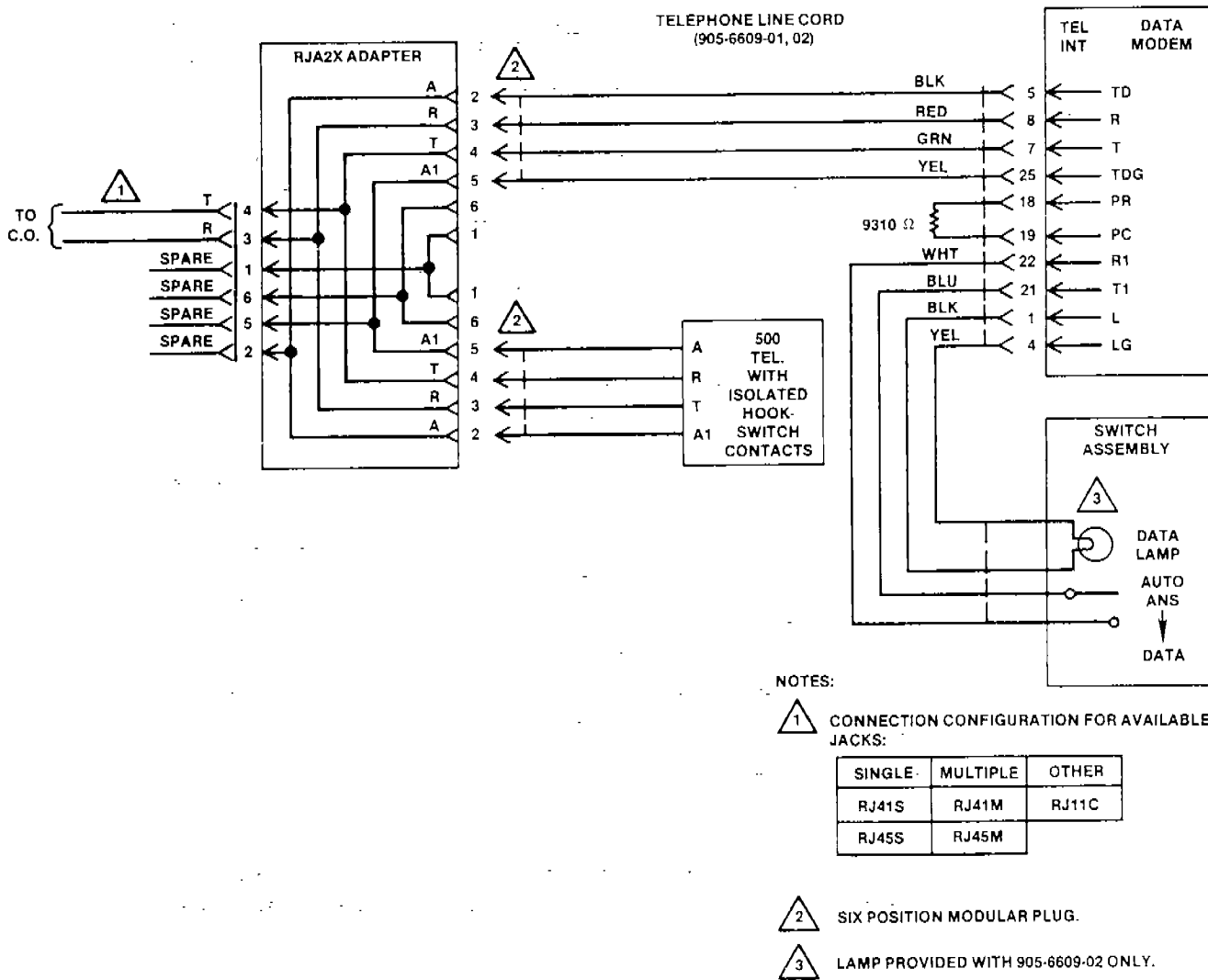
79205-0

Fig. 2-11. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6608-02 Telephone Cord for Fixed Loss Loop Applications



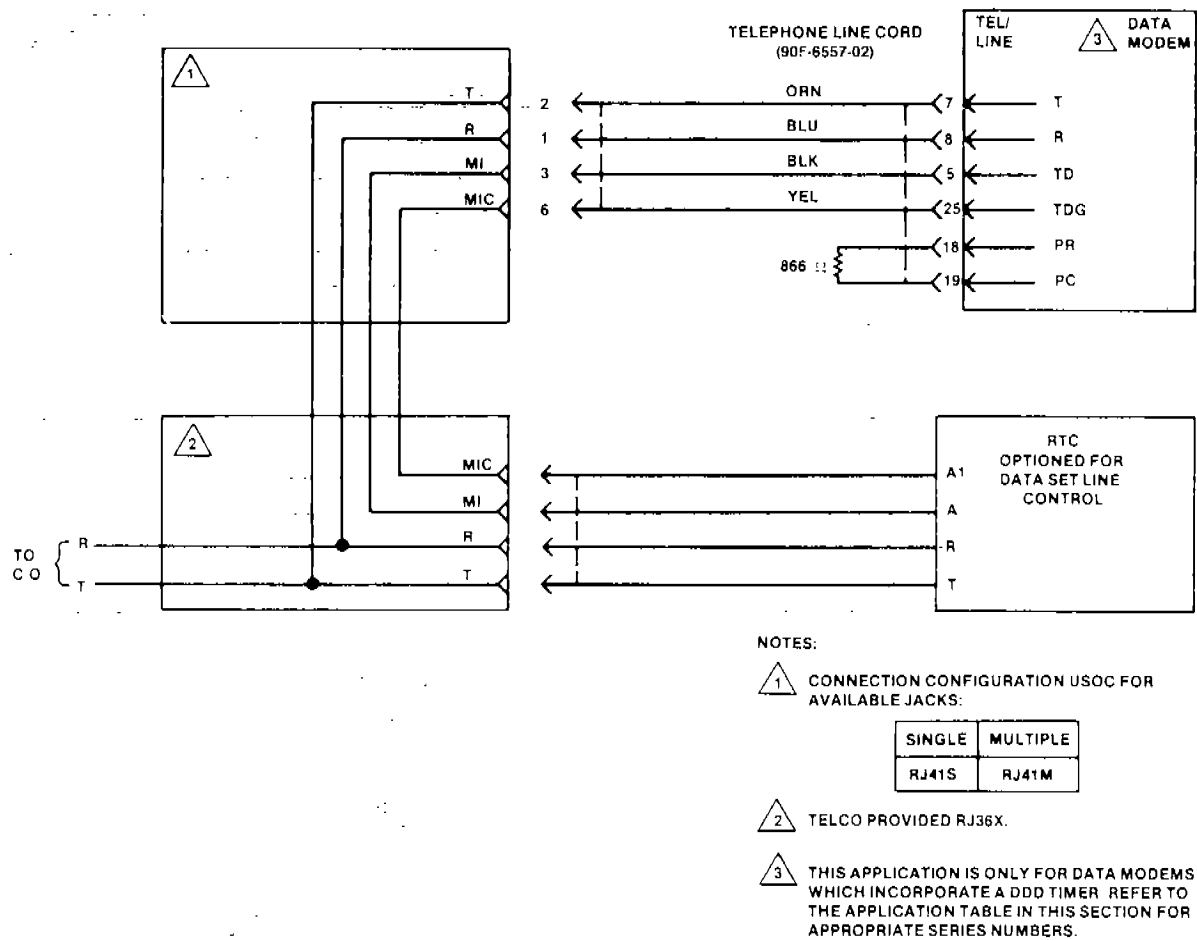
79171-0

**Fig. 2-12. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6608-01 Telephone Cord for Programmable Applications**



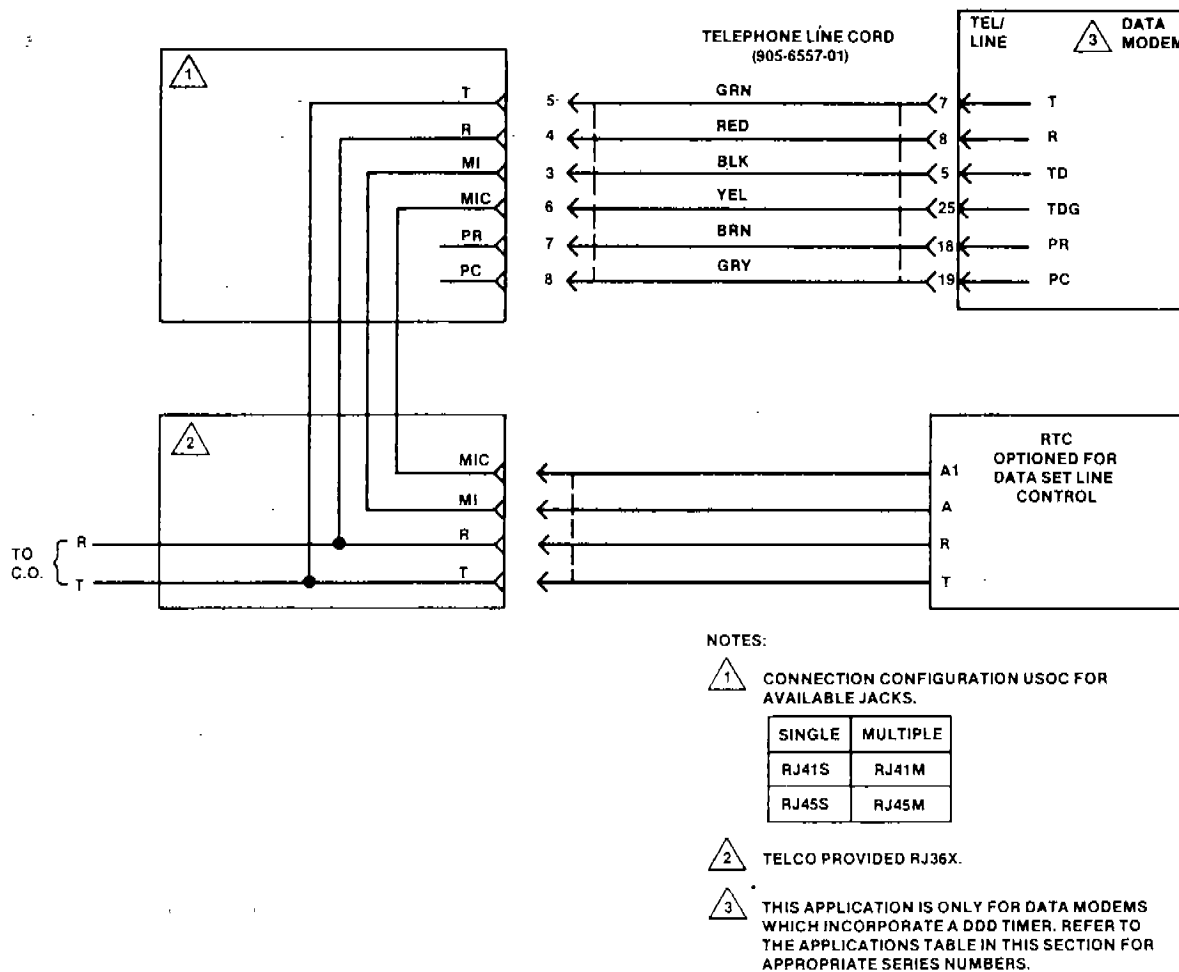
79174-1

**Fig. 2-13. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6609-01 or -02 Telephone Cord for Permissive Applications**



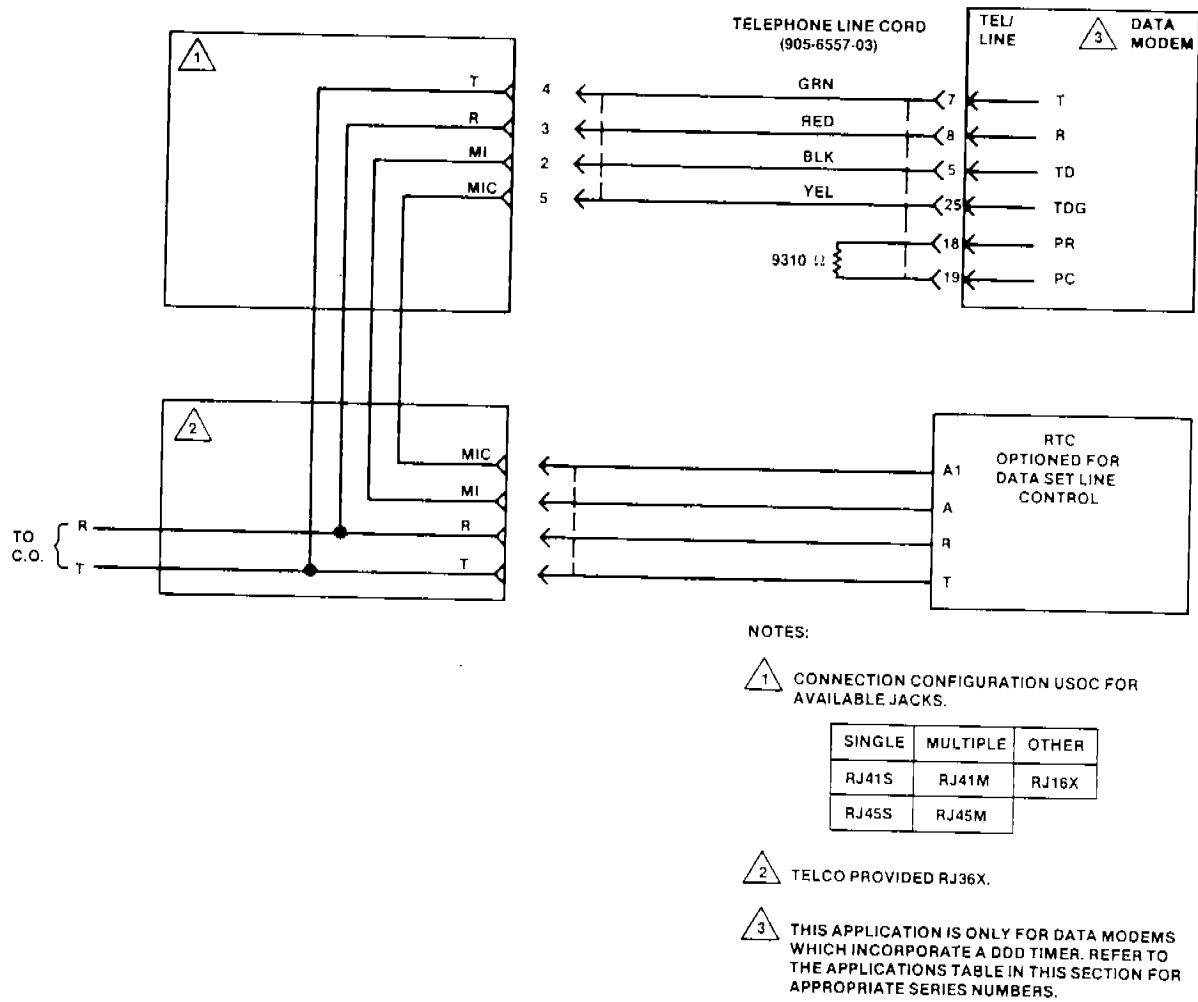
79210-0

**Fig. 2-14. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6557-02 Telephone Cord for Fixed Loss Loop Applications**



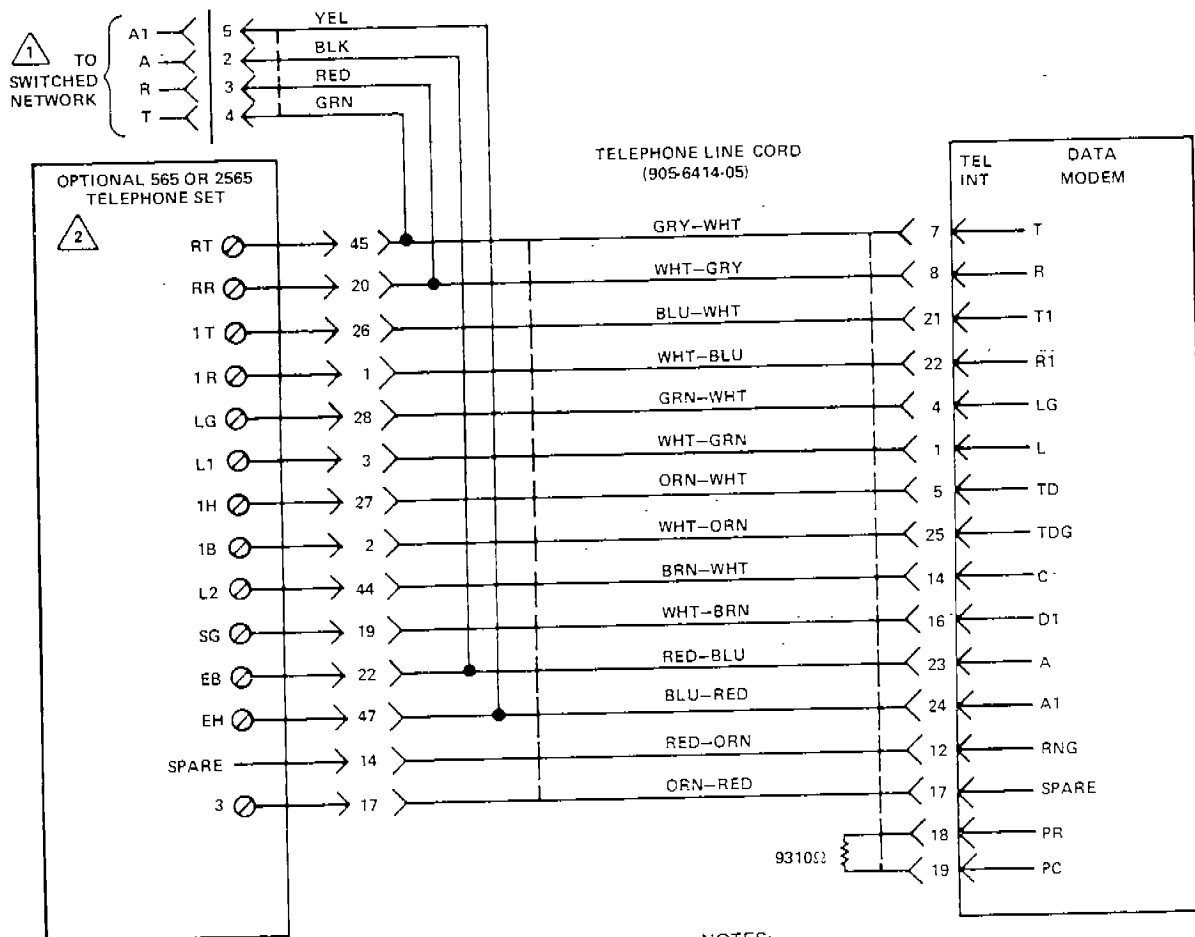
79167-0

**Fig. 2-15. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6557-01 Telephone Cord for Programmable Applications**



79211-0

**Fig. 2-16. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6557-03 Telephone Cord for Permissive Applications**



NOTES:

1 CONNECTION CONFIGURATIONS FOR AVAILABLE JACKS.

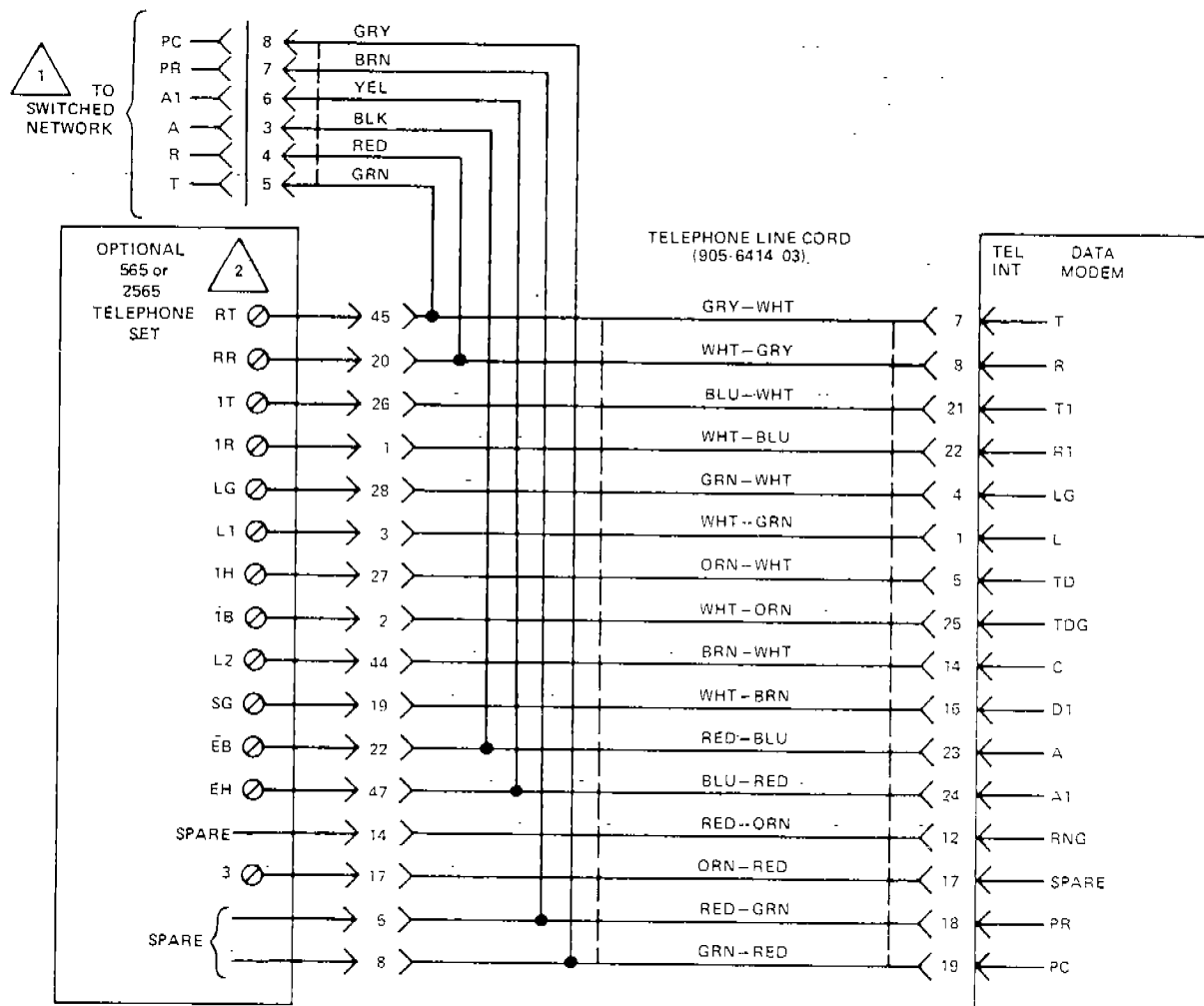
SINGLE	MULTIPLE	OTHER
RJ41S	RJ41M	RJ11C
RJ45S	RJ45M	

2 WHEN AN EXCLUSION KEY IS INCORPORATED IN THE 565 OR 2565 TELEPHONE IT MUST BE MODIFIED AS PER THE EXCLUSION KEY REMOVAL MODIFICATION PARAGRAPH IN THIS SECTION

78041-1

Fig. 2-17. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6414-05 Telephone Cord for Permissive Applications





## NOTES:



CONNECTION CONFIGURATION USOC FOR AVAILABLE JACKS:

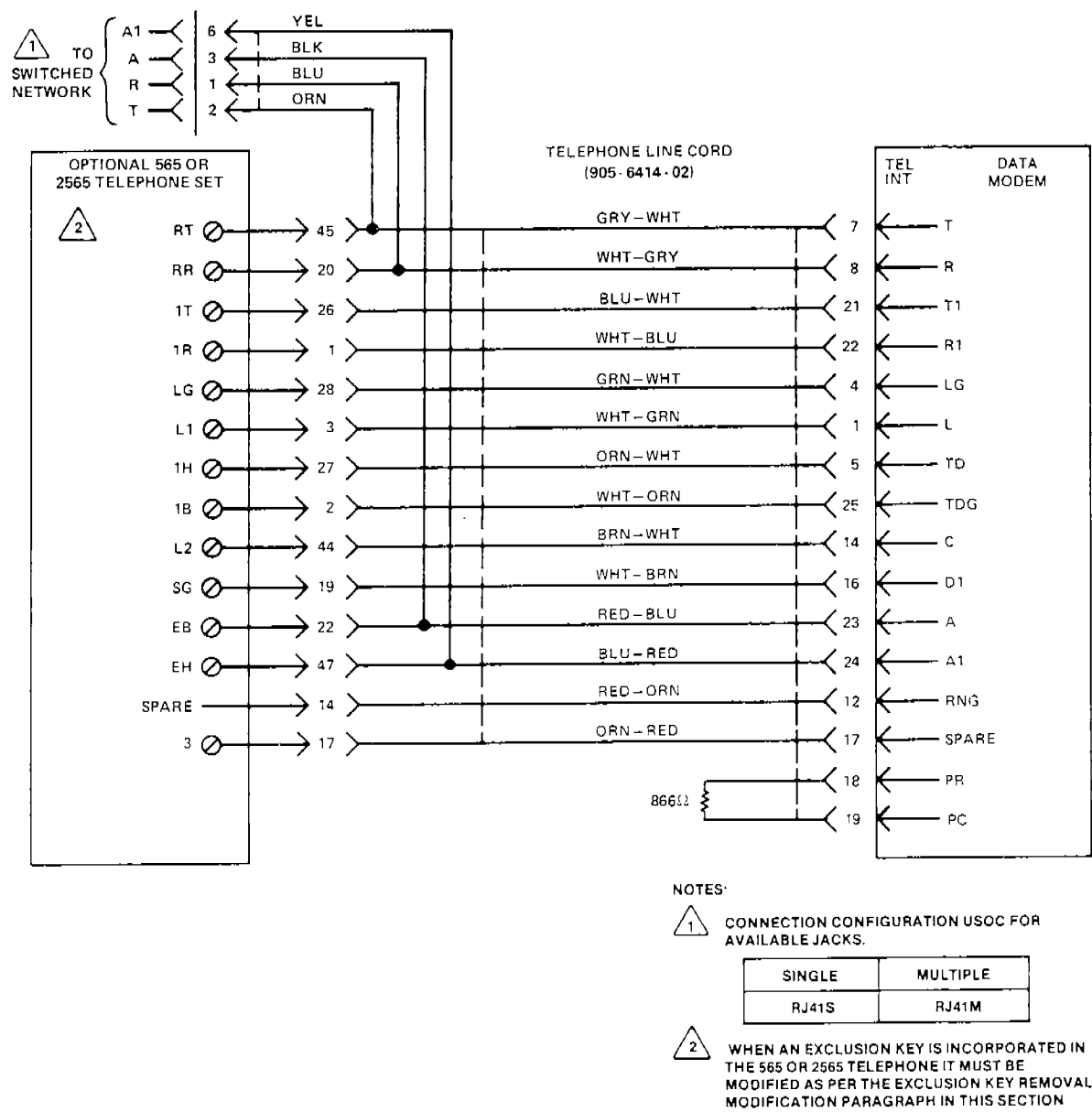
SINGLE	MULTIPLE
RJ41S	RJ41M
RJ45S	RJ45M



WHEN AN EXCLUSION KEY IS INCORPORATED IN THE 565 OR 2565 TELEPHONE IT MUST BE MODIFIED AS PER THE EXCLUSION KEY REMOVAL MODIFICATION PARAGRAPH IN THIS SECTION.

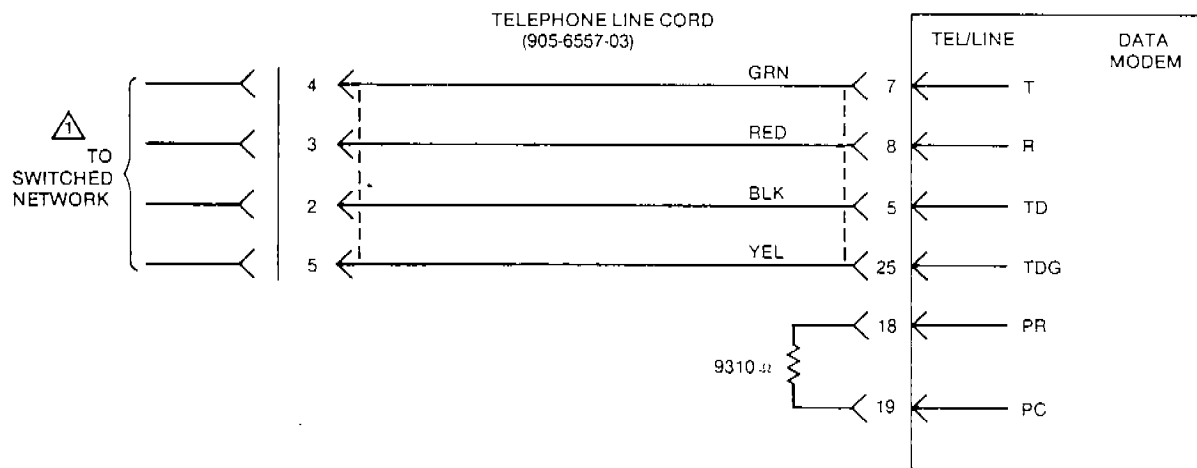
/7055-0

**Fig. 2-18. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6414-03 Telephone Cord for Programmable Applications**



77054-0

**Fig. 2-19. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6414-02 Telephone Cord for Fixed Loss Loop Applications**



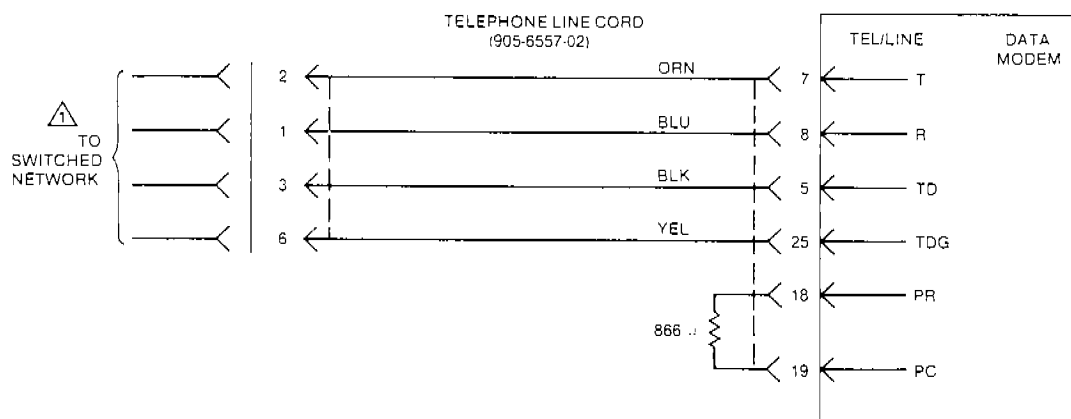
NOTE:

△ CONNECTION CONFIGURATION  
USOC FOR AVAILABLE JACKS.

SINGLE	MULTIPLE	OTHER
RJ41S	RJ41M	RJ11C
RJ45S	RJ45M	

79218-1

**Fig. 2-20. T212A Interconnection to DDD Network Via Telco Jack Using  
905-6557-03 Telephone Cord for Permissive Applications  
in Automatic Answer Only Operation**



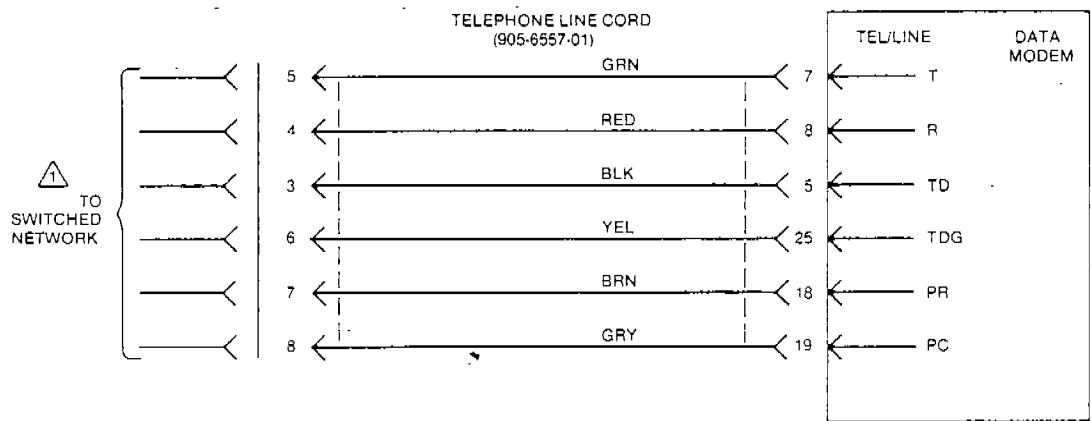
NOTE:

△ CONNECTION CONFIGURATION  
USOC FOR AVAILABLE JACKS.

SINGLE	MULTIPLE
RJ41S	RJ41M

79217-0

**Fig. 2-21. T212A Interconnection to DDD Network Via Telco Jack Using  
905-6557-02 Telephone Cord for Fixed Loss Loop Applications  
in Automatic Answer Only Operation**

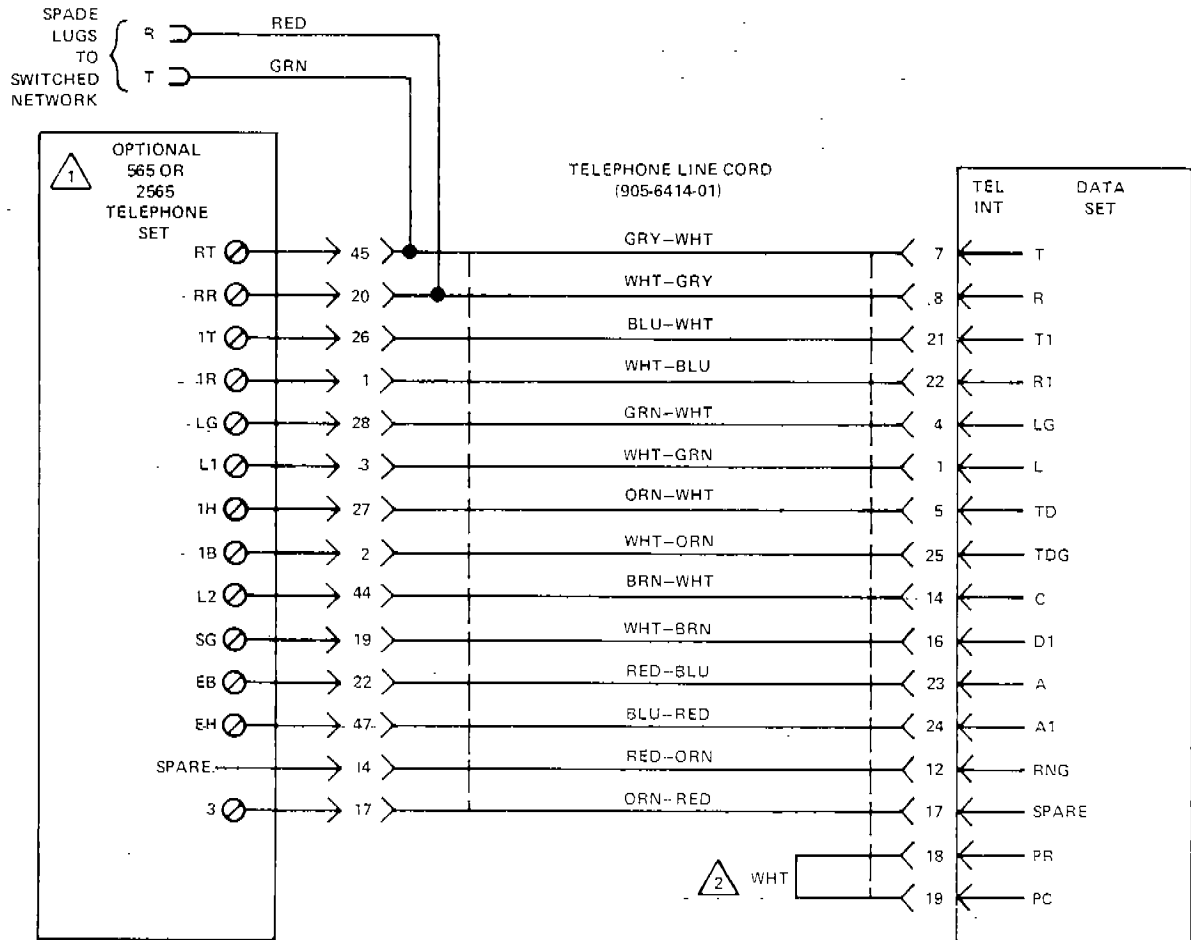


NOTE:  
⚠ CONNECTION CONFIGURATION  
USOC FOR AVAILABLE JACKS.

SINGLE	MULTIPLE
RJ41S	RJ41M
RJ45S	RJ45M

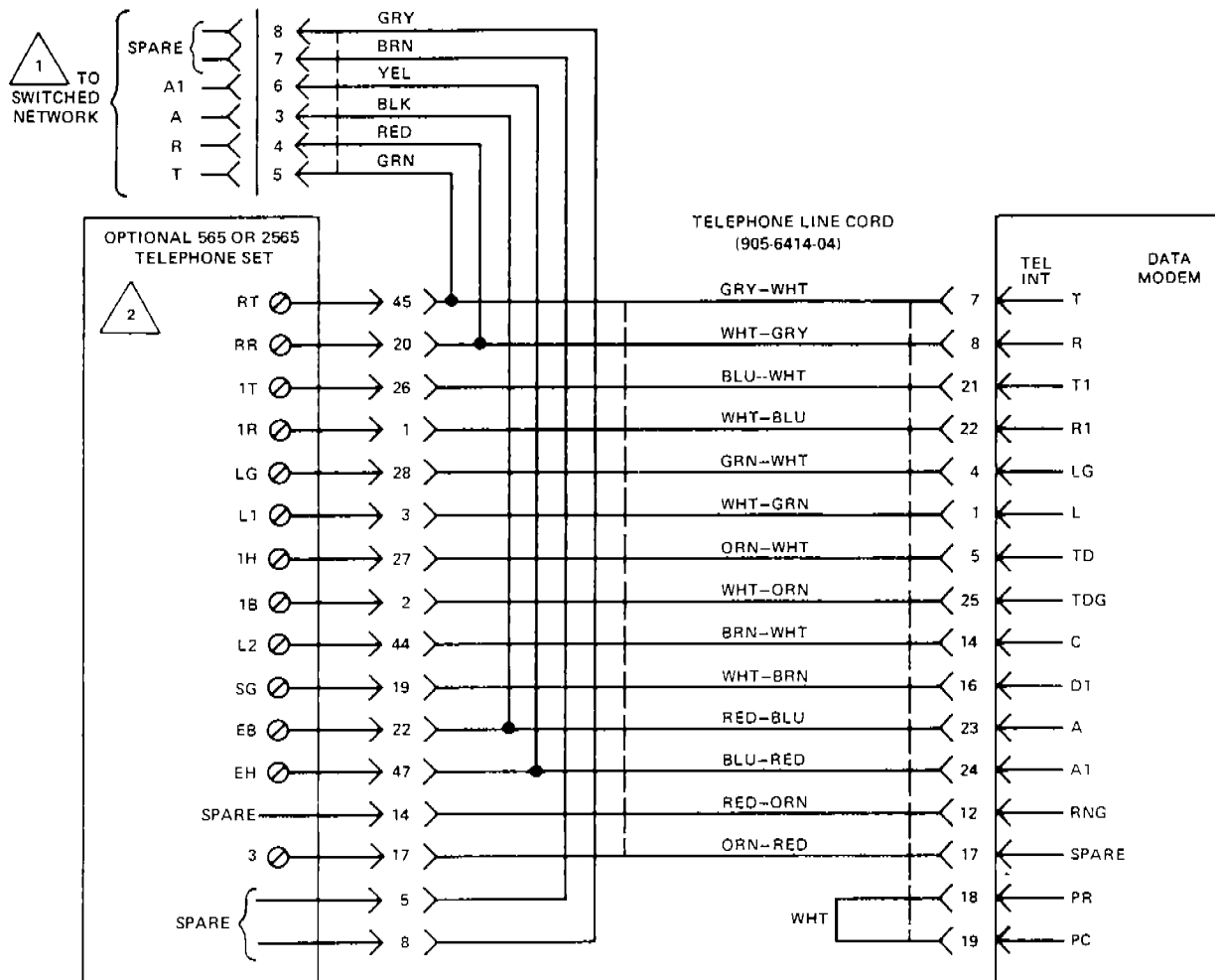
79216-0

**Fig. 2-22. T212A Interconnection to DDD Network Via Telco Jack Using  
905-6557-01 Telephone Cord for Programmable Applications  
in Automatic Answer Only Operation**



78011-0

**Fig. 2-23. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6414-01 Telephone Cord for Adjustable Applications**



NOTES:



CONNECTION CONFIGURATION USOC FOR AVAILABLE JACKS:

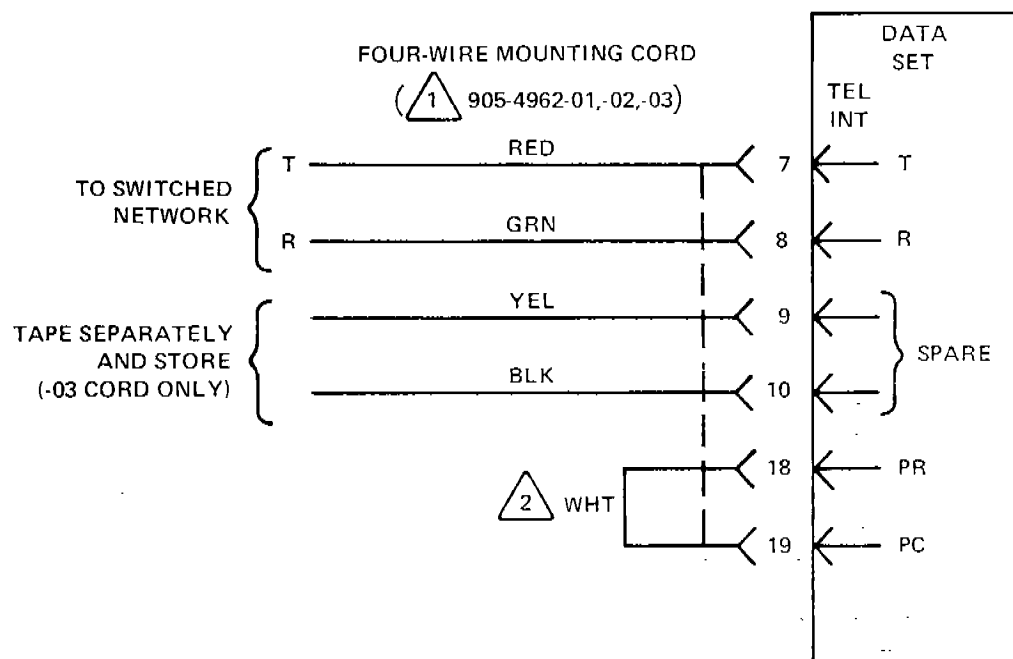
SINGLE	MULTIPLE
RJ41S	RJ41M
RJ45S	RJ45M



WHEN AN EXCLUSION KEY IS INCORPORATED IN THE 565 OR 2565 TELEPHONE IT MUST BE MODIFIED AS PER THE EXCLUSION KEY REMOVAL MODIFICATION PARAGRAPH IN THIS SECTION.

77056-0

**Fig. 2-24. T212A and Telephone Interconnection to DDD Network Via Telco Jack Using 905-6414-04 Telephone Cord for Adjustable Applications**



## NOTES:

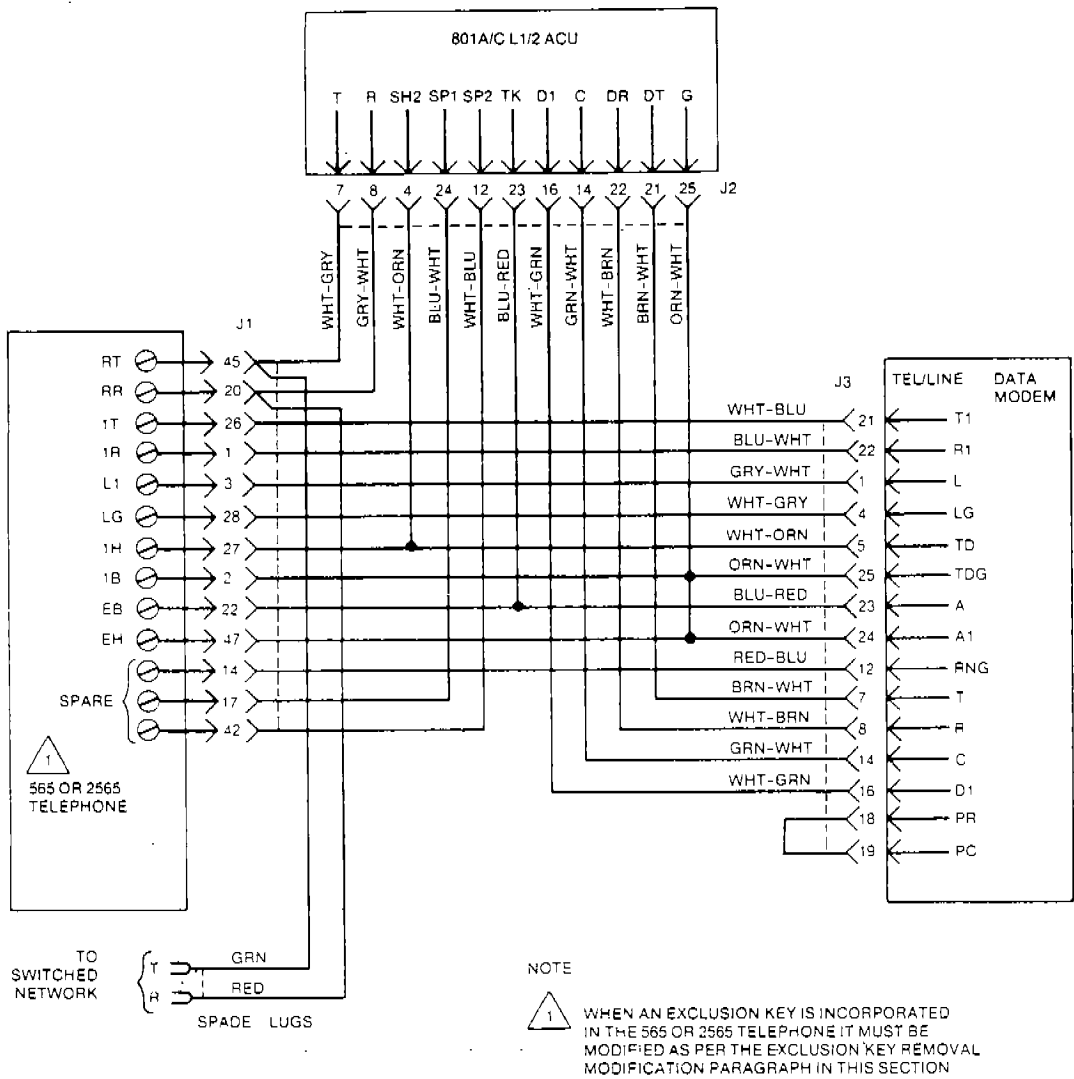
UNUSED DATA SET PINS NOT SHOWN.

(1) -01 AND -02 ARE EQUIPPED WITH 283B4 PLUG.  
-03 IS EQUIPPED WITH SPADE LUGS.

(2) INCLUDED IN CONNECTOR SHELL OF SERIES 2  
AND LATER. SERIES 2 OR LATER IS REQUIRED  
FOR PROGRAMMABLE DATA SETS.

78010-0

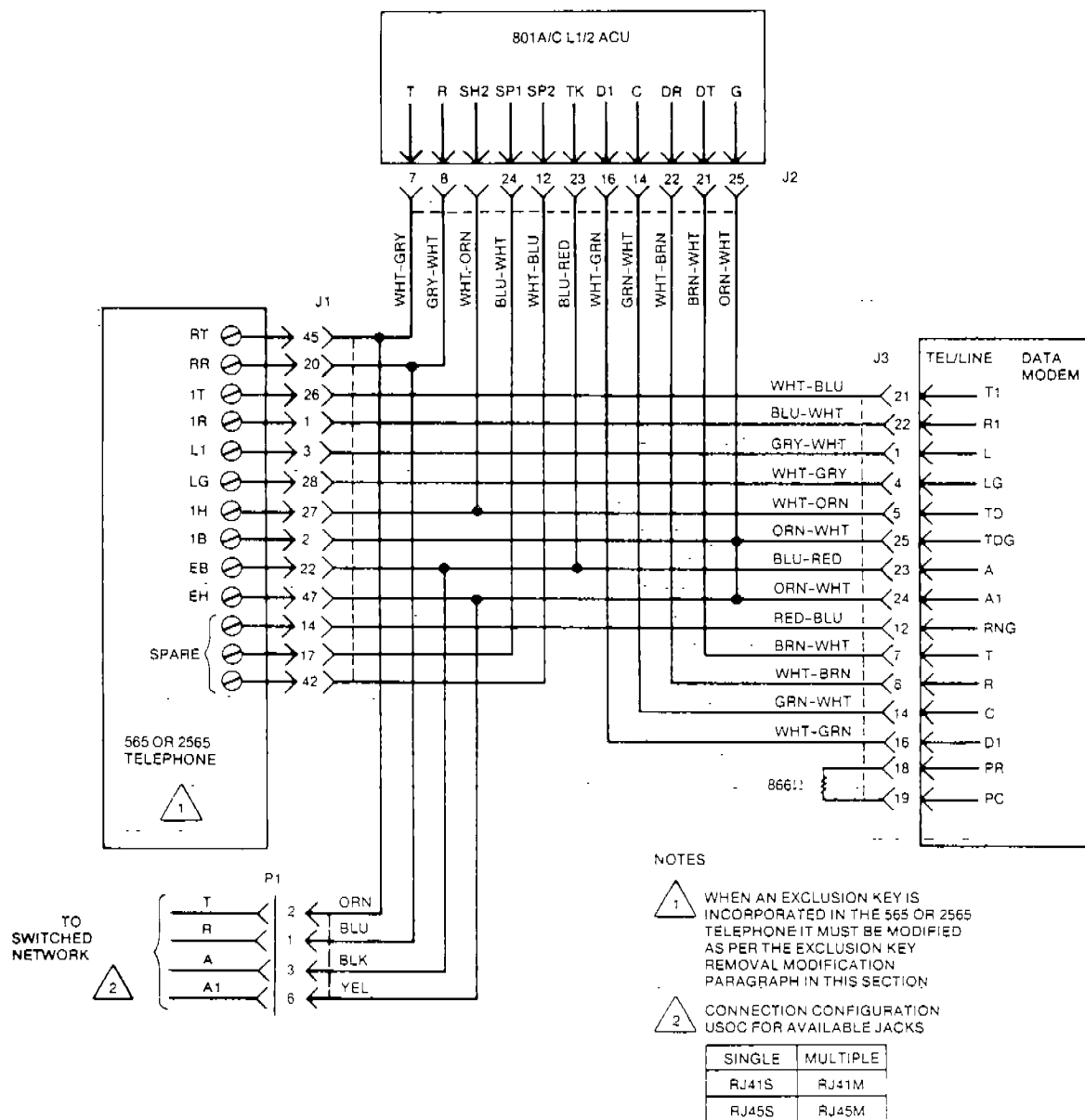
**Fig. 2-25. T212A Interconnection to DDD Network Using 905-4962-01 and -03 Telephone Cord for Adjustable Applications in Automatic Answer Only Operation**



79198-0

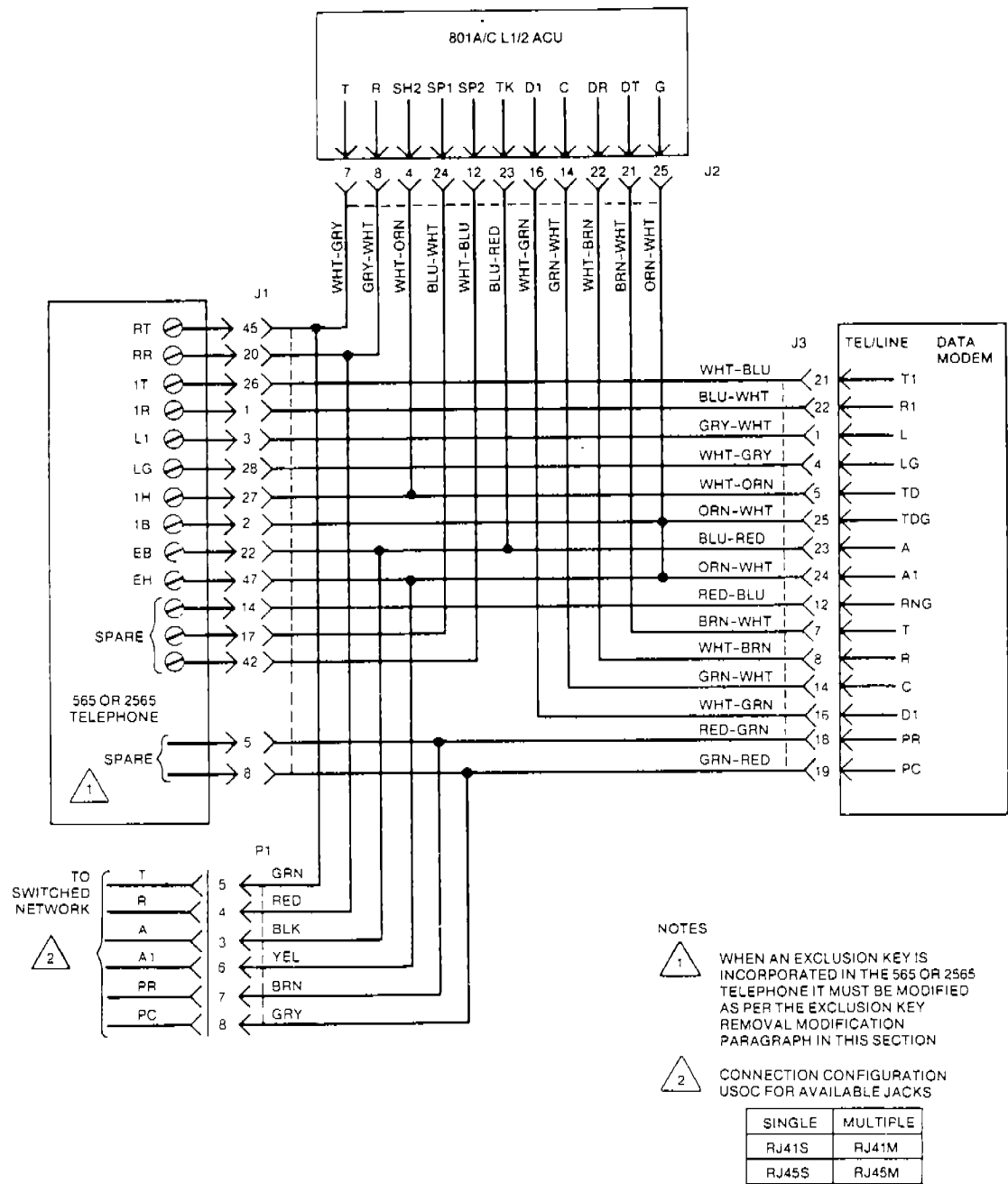
Fig. 2-26. T212A, Telephone, and 801C L1/2 ACU Interconnection to DDD Network Using 905-6630-01 Telephone Cord for Adjustable Applications





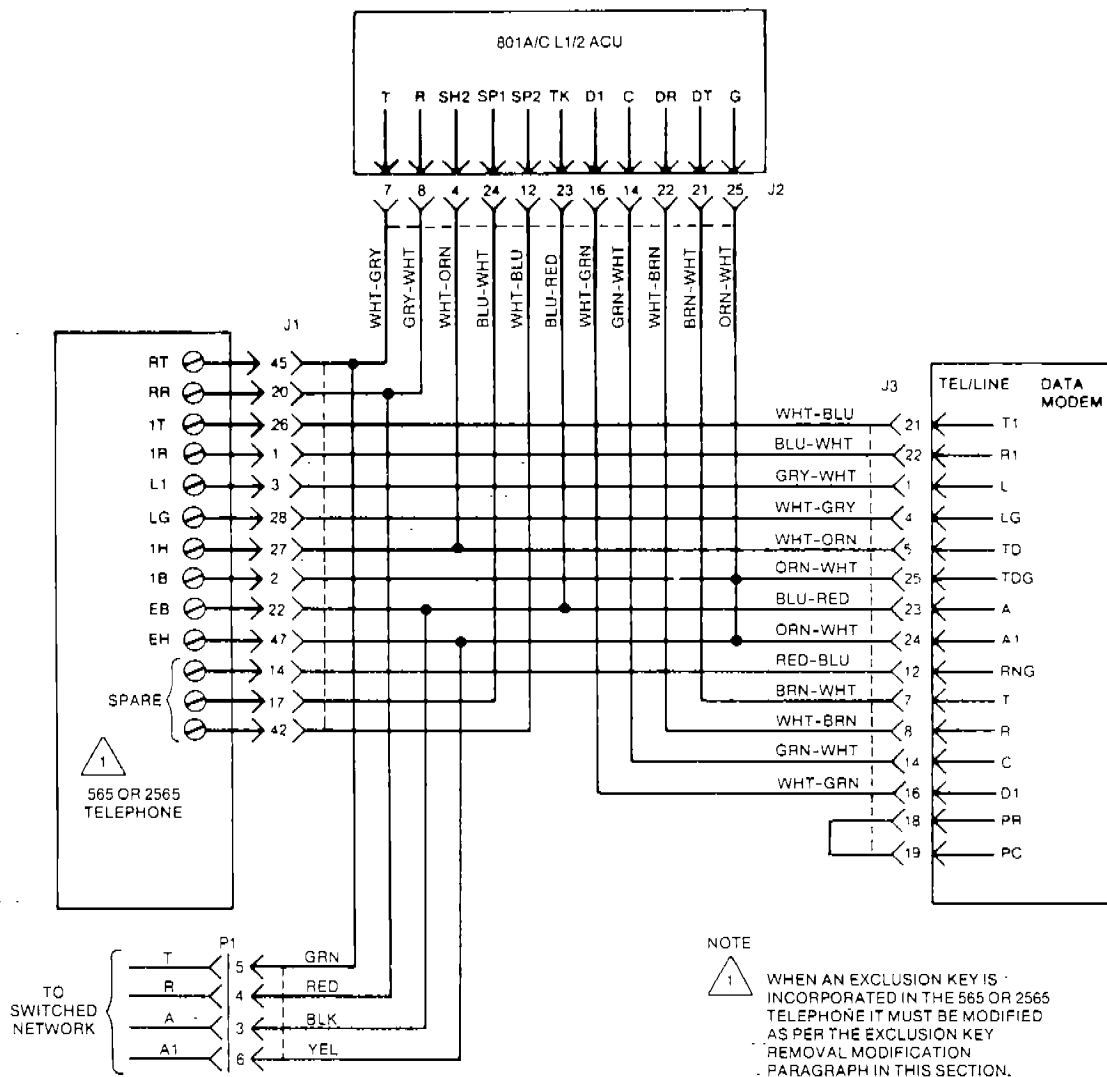
79195-0

**Fig. 2-27. T212A, Telephone, and 801C L1/2 ACU Interconnection to DDD Network Using 905-6630-02 Telephone Cord for Fixed Loss Loop Applications**



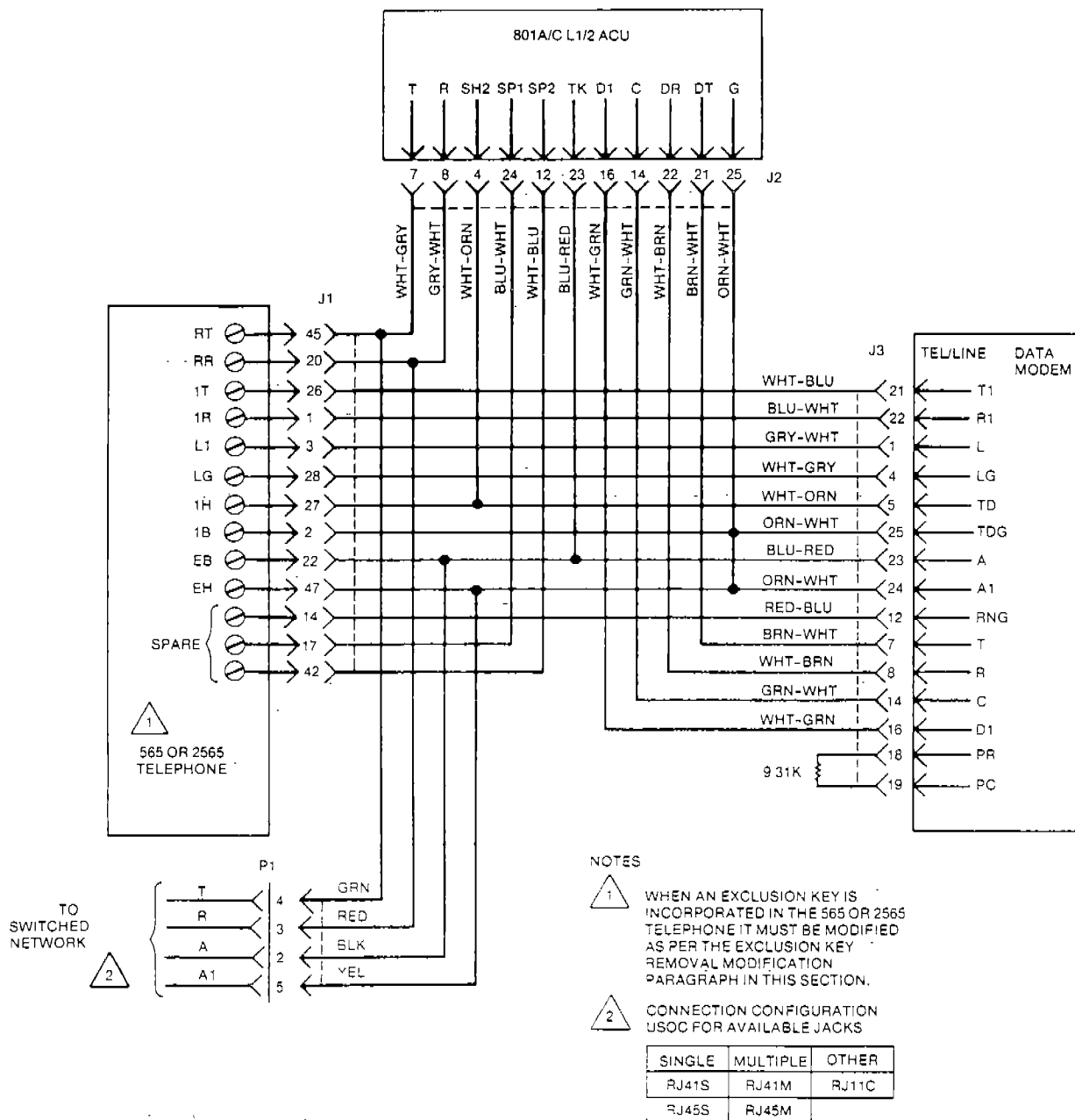
79196-0

Fig. 2-28. T212A, Telephone, and 801C L1/2 ACU Interconnection to DDD Network Using 905-6630-03 Telephone Cord for Programmable Applications



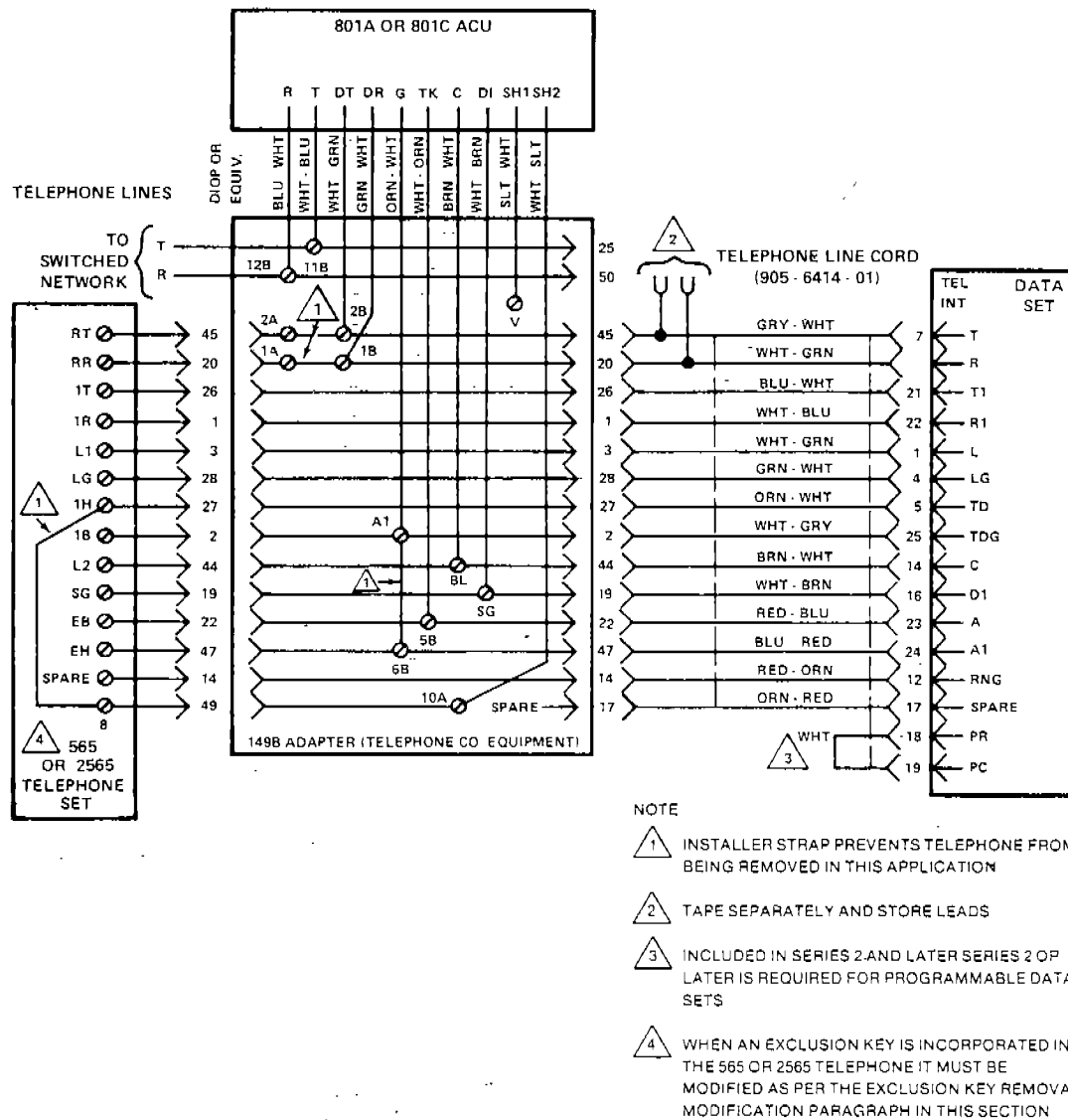
80014-0

**Fig. 2-29. T212A, Telephone, and 801C L1/2 ACU Interconnection to DDD Network Using 905-6630-04 Telephone Cord for Adjustable Applications**



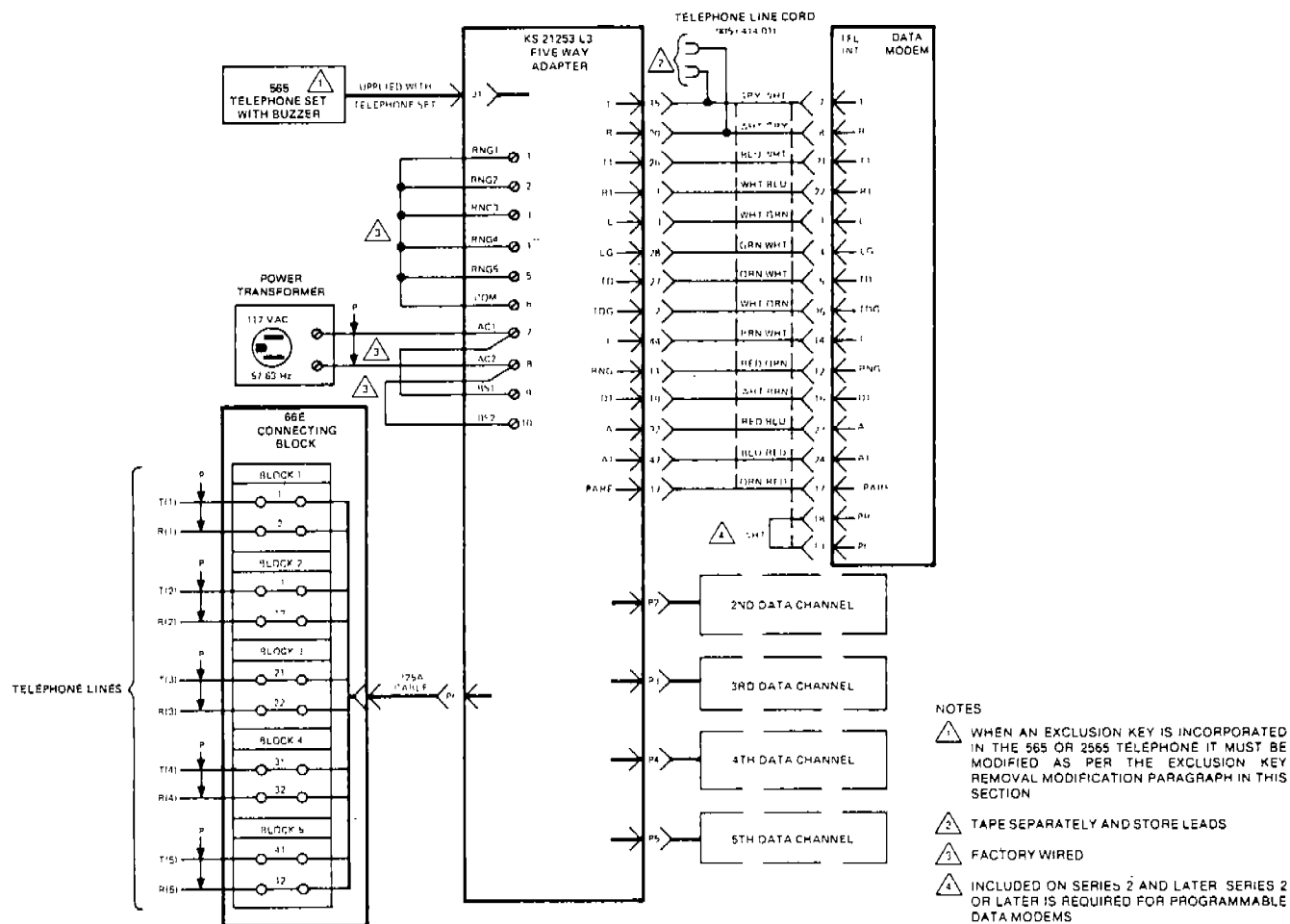
79197-1

**Fig. 2-30. T212A, Telephone, and 801C L1/2 ACU Interconnection to DDD Network using 905-6630-05 Telephone Cord for Permissive Applications**



78039-0

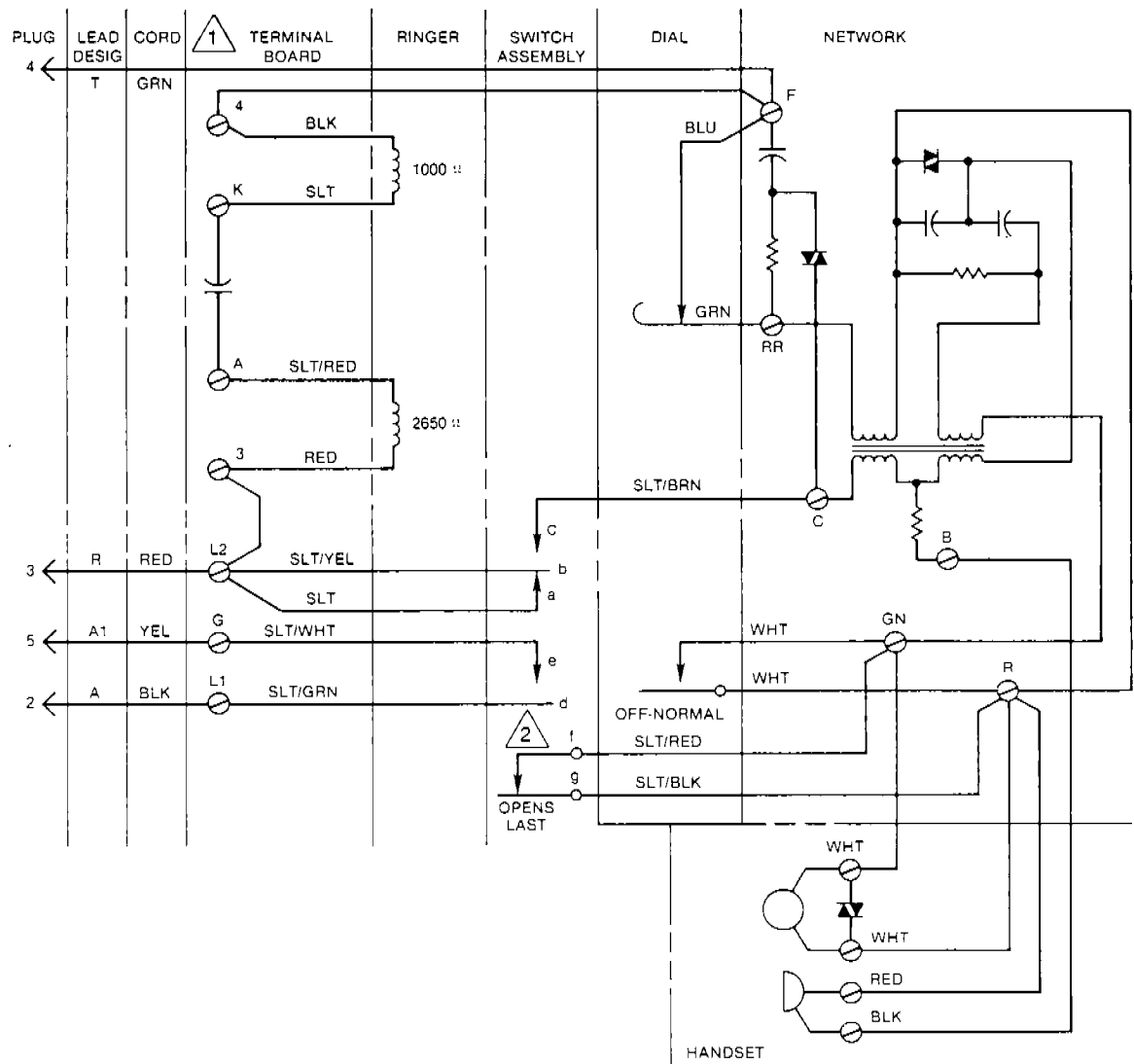
**Fig. 2-31. T212A, Telephone, and ACU Interconnection to DDD Network Using 149B Adapter**



78014-0

**Fig. 2-32. Multiple Individually Housed T212A, Telephone, and Five-Way Adapter Interconnection to DDD Network**





## NOTES:

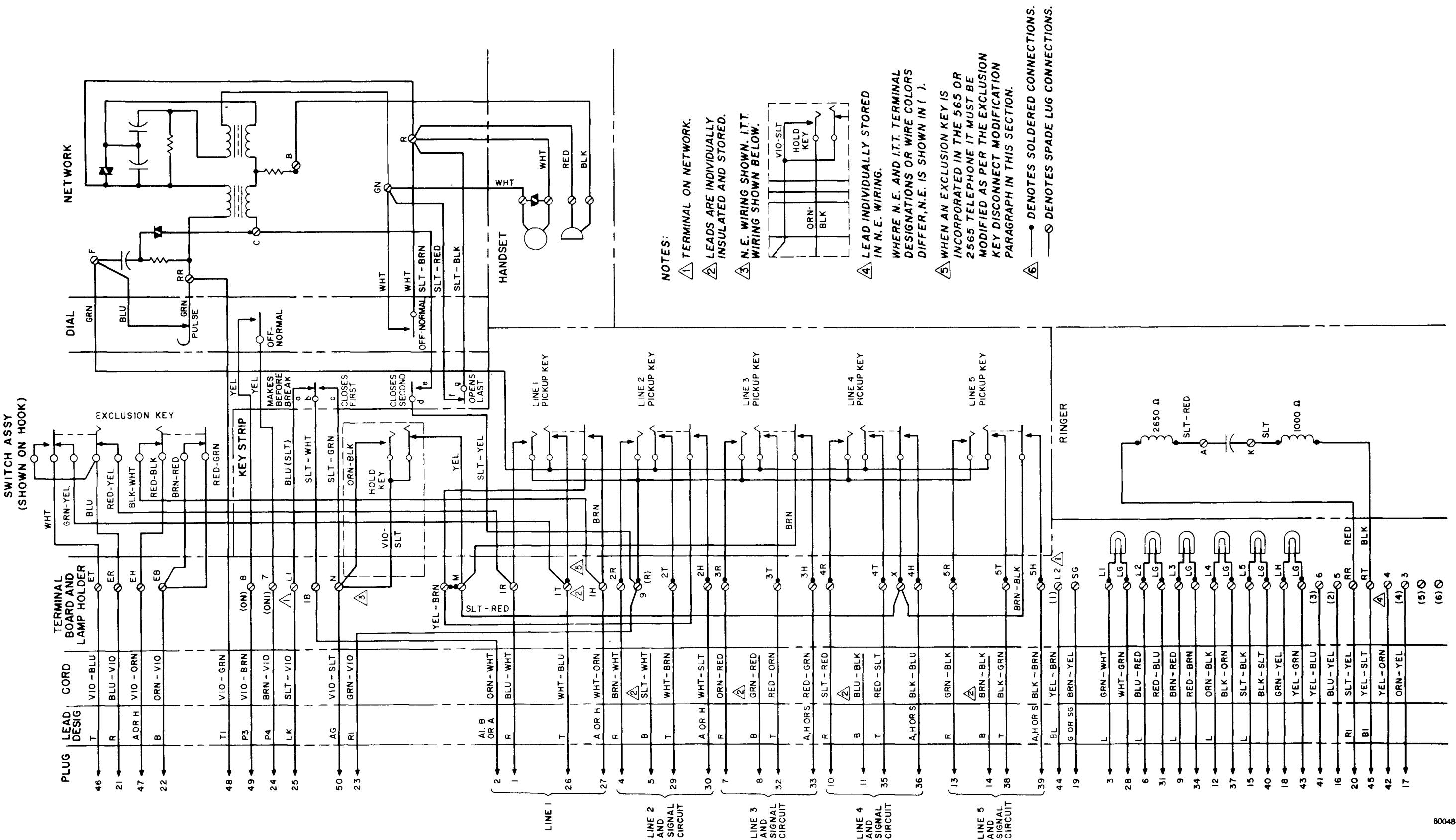
△ 1 TERMINAL STRIP CONNECTIONS 3 AND 4 NOT SUPPLIED ON SOME MODELS.

△ 2 WHEN THE HANDSET IS REMOVED CONTACT g f BREAKS LAST.

79212-2

Fig. 2-34. 500 Telephone Schematic Diagram





### Fig. 2-35. 565 Telephone Schematic Diagram



**Page 59**  
**59 Pages**

## T212A DATA SET SELF-DIAGNOSTICS

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### 1. GENERAL

#### A. Introduction

**1.01** This section provides procedures used in testing T212A Data Sets and associated system components. Procedures in this section employ self-testing features of the T212A. External test equipment is not required. These tests should be performed before reporting a data set malfunction.

**1.02** This section is being reissued to clarify testing information and add references.

### B. Pretest Checks

**1.03** Before performing any test check that the following requirements are met:

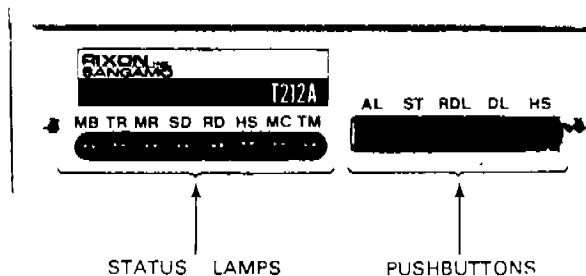
- Data set options are correctly selected for service application and noted.
- Data set is correctly connected.
- Power is applied to terminal and data set.

### C. Data Set Pushbuttons

**1.04** The self-diagnostics employs five pushbuttons located on the front panel of the data set, as shown in Fig. 3-1. Once pressed, the switch remains in. When pressed a second time the switch releases and returns to the out position.

**1.05** Pushbutton switches are labeled and function as follows:

- AL — (Analog Loopback) conditions data set to permit local testing by customer terminal equipment.
- ST — (Self-Test) activates test pattern generator and error detector. Cust. Int. lead



2141D

**Fig. 3-1. Data Set Pushbuttons and Lamps**

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RL, if optioned and on, disables ST pushbutton.

- RDL — (Remote Digital Loopback) automatically sets remote data set to digital loopback mode. RDL pushbutton is only effective when local data set is in high speed mode.
- DL — (Digital Loopback) conditions local data set for testing from remote site or Data Test Center.
- HS — (High Speed) conditions data set for 1200 bps operation.

#### D. System Checkout

**1.06** A system checkout sequence is provided in Fig. 3-2. Because local or remote equipment parameters may make listed system checkout test impractical or inconvenient, this section provides additional test procedures utilizing T212A self-diagnostic features.

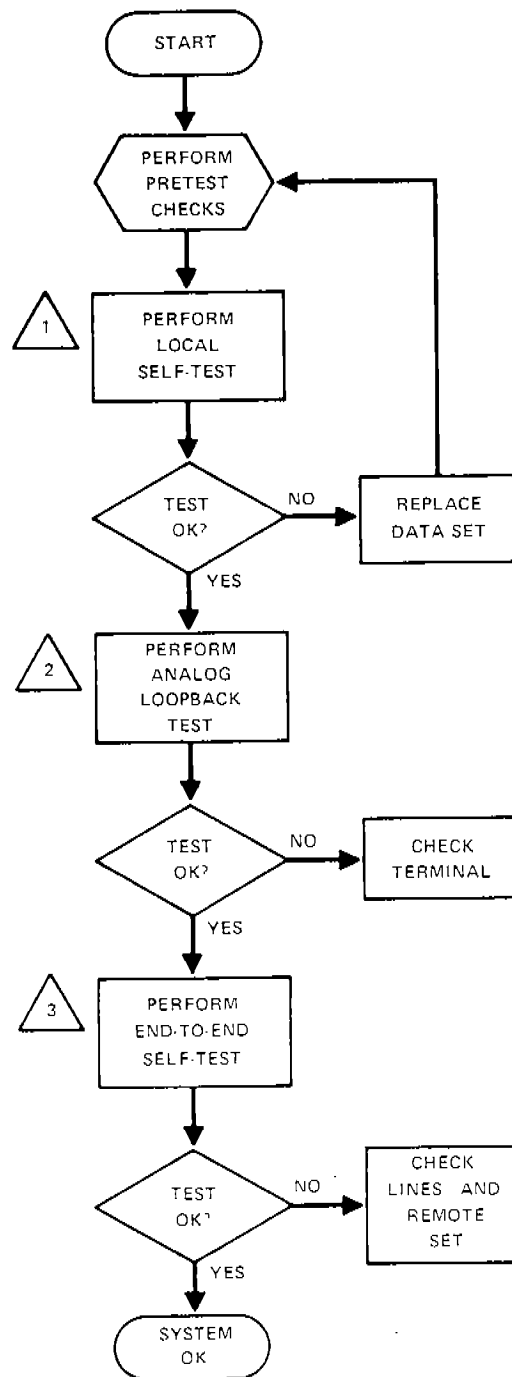
#### 2. LOCAL SELF-TEST

**2.01** The local self-test provides an independent check of the data set transmitter and receiver. The data set transmits an internally generated test pattern which is looped from transmitter back to receiver. The test may be performed in high or low speed mode. If performed in the low speed mode front panel MC lamp lights when received data exceeds the 25 percent distortion threshold. If performed in the high speed mode MC lights if a bit error is detected in received data.

**2.02** Fig. 3-3 provides a block diagram of a T212A Data Set while in the local self-test configuration. If the data set is optioned for tip and ring Make Busy (MB), and connected to the telephone network, the telephone line is made busy during local self-test.

**2.03** To perform a local self-test:

- Press data set AL and ST pushbuttons.
- Data set lamps MB, SD, RD, and TM light. Ignore TR and MR lamps. MC lamp goes out.
- Observe MC lamp for 1 min. If MC lamp lights data set has failed test in low speed mode.

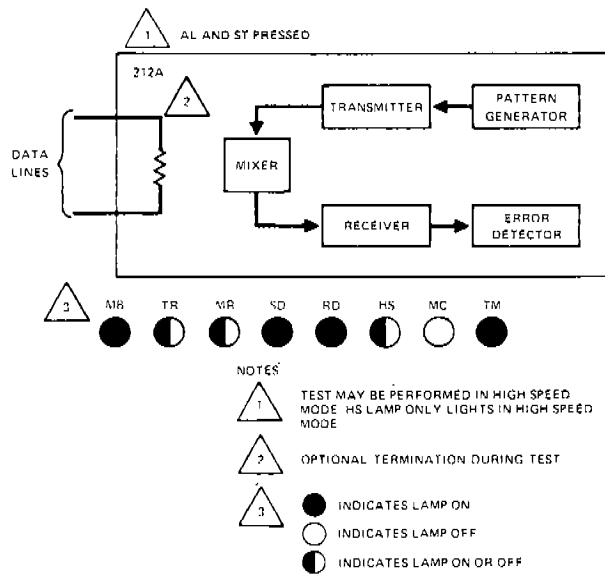


#### NOTES:

- 1 REFER TO PART 2 OF 300 SECTION.
- 2 REFER TO PART 3 OF 300 SECTION.
- 3 REFER TO PART 4 OF 300 SECTION.

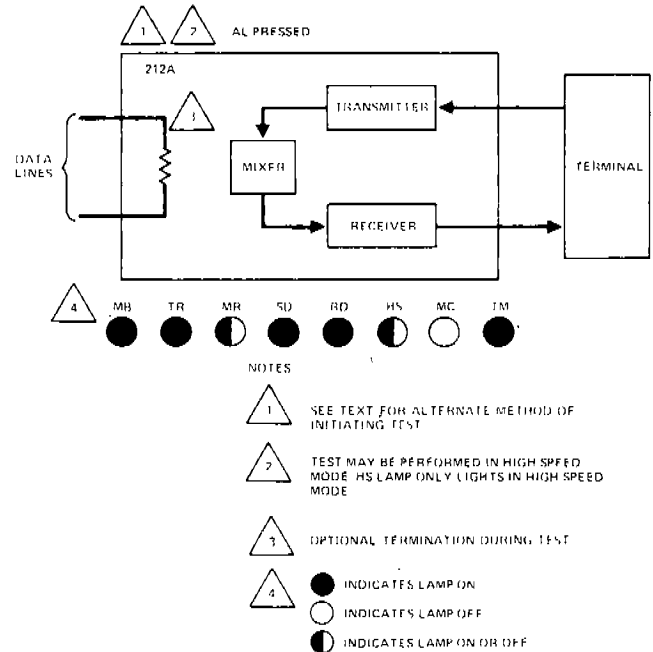
780022

**Fig. 3-2. System Checkout Diagram**



### Fig. 3-3. Local Self-Test

780023



### Fig. 3-4. Analog Loopback Test

780024

- (d) Press data set HS pushbutton.
- (e) After a short delay data set lamps MB, SD, RD, HS, and TM light and MC lamp goes out.
- (f) Observe MC lamp for 1 min. If MC lamp lights data set has failed test in high speed mode.
- (g) To restore station to idle mode press (release) AL, ST, and HS pushbuttons.

### 3. ANALOG LOOPBACK TEST

**3.01** During analog loopback the terminal, data set, and terminal to data set interface is tested. Terminal generated data is looped through the data set transmitter, mixer, receiver, and back to the terminal. A block diagram of the analog loopback test is provided in Fig. 3-4. Ring Indicator circuit (CE) is operational during analog loopback testing if Make Busy is optioned no (MB position). If Make Busy is optioned yes (MB position) the telephone line is placed in the busy state. Option ZF should be installed for terminals that require Data Set Ready indicator (CC) on during loopback testing. Data Set lamp MR lights during test if option ZF is installed.

## Restrictions

- 3.02** To initiate the test Data Terminal Ready lead (CD) must be on.
- 3.03** To perform the analog loopback test:
  - (a) Press data set AL pushbutton.
  - (b) Refer to terminal procedures and apply recommended test inputs to data set. Verify that terminal receives proper outputs from data set. Refer to Fig. 3-4 for lamp states.
  - (c) Speed mode may be changed during test if terminal ability and data set option selection permit.
  - (d) Press (release) AL pushbutton to end test.
  - (e) TM lamp goes out. Station is restored to idle state.

## Alternate Methods

**3.04** An analog loopback test may be initiated through terminal interface lead CN. If Cust. Int. control of CN feature is in yes position (YE) and terminal applies on condition, CN circuit

places the data set in analog loopback. When option YE is installed grounding or opening the CN lead also activates the CN circuit. The restrictions listed in paragraph 3.02 apply when this alternate method is employed. In addition, the CN lead is ignored when front panel DL pushbutton is pressed.

**3.05** The function of the data set HS switch can be achieved by Cust. Int. lead CH when the data rate control feature is optioned in Cust. Int. (CH) position. If CH use is optioned, data rates are high when CH is set to on, and low when CH is set to off.

#### 4. END-TO-END SELF-TEST

**4.01** This test checks the local and remote data sets, lines, and data set to line interfaces at both sites. Each data set sends an internally generated test pattern to the other site. The test speed mode is determined by the originating data set. Received data is checked for bit errors in the high speed mode or excess distortion in the low speed mode. A block diagram of the end-to-end self-test is provided in Fig. 3-5.

**NOTE:** For low speed testing the remote data set may be a T103J, T113D, or equivalent.

#### 4.02 To perform an end-to-end self-test:

- (a) Press ST pushbutton at local data set and observe that TM lamp lights. HS pushbutton may also be pressed if high speed operation is normally required.
- (b) Call remote attended site and request ST pushbutton be pressed. Verify that remote TM lamp lights.
- (c) Enter data mode in normal manner. After line connection is established between local and remote data sets observe that lamp pattern is as shown in Fig. 3-5.
- (d) Observe MC lamp for 2 min. In high speed mode MC should not light or flash more than twice. In the low speed mode if MC lights, a 25 percent distortion threshold has been exceeded.
- (e) To end test return to talk mode and press (release) ST pushbuttons at both sites. TM lamp goes out. If CD is on and appropriate speed mode has been selected the system is ready.

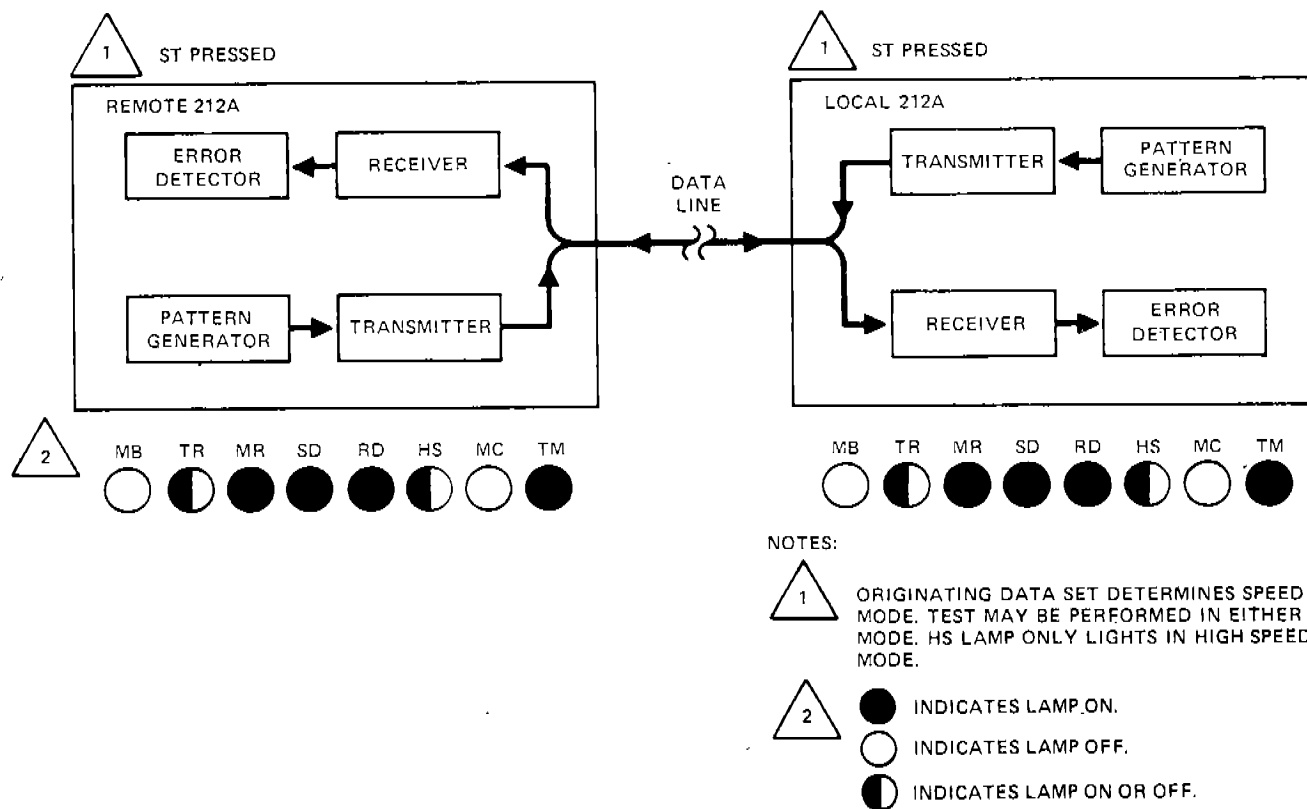


Fig. 3-5. End-To-End Self-Test

780025

## Alternate Methods

4.03 Refer to paragraph 3.05.

## 5. DIGITAL LOOPBACK TEST

5.01 The T212A Data Set is manually conditioned to act as a repeater during a digital loopback test. A testing site transmits terminal generated data which is received and retransmitted by the loopback site. As shown in Fig. 3-6, the test checks the loopback data set, lines, testing data set, testing terminal, and interfaces between each system component. Round trip error accumulation or distortion should be measured at the testing terminal.

5.02 The digital loopback test can be performed in either the high or low speed mode. The originating site determines speed mode and data set HS lamp lights accordingly. At the loopback site, loss of carrier disconnect feature is forced to yes option (S) during the digital loopback test. When DL pushbutton is pressed the automatic answer feature is forced to yes option (ZH).

## Restrictions

5.03 If the testing data set employs a transmitter timing feature which is optioned in the slave position (WI) the digital loopback test cannot be performed in the high speed mode.

**NOTE:** For low speed testing the remote data set may be a T103J, T113D, or equivalent.

5.04 To perform a digital loopback test:

- (a) Press DL pushbutton at local (loopback) data set and observe that TM lamp lights.
- (b) Call remote (testing) site and request a terminal generated test pattern be sent. Enter data mode in normal manner.
- (c) After line connection is made between loopback and testing data set observe that light pattern is as shown in Fig. 3-6.
- (d) Resume voice mode after test and determine results.

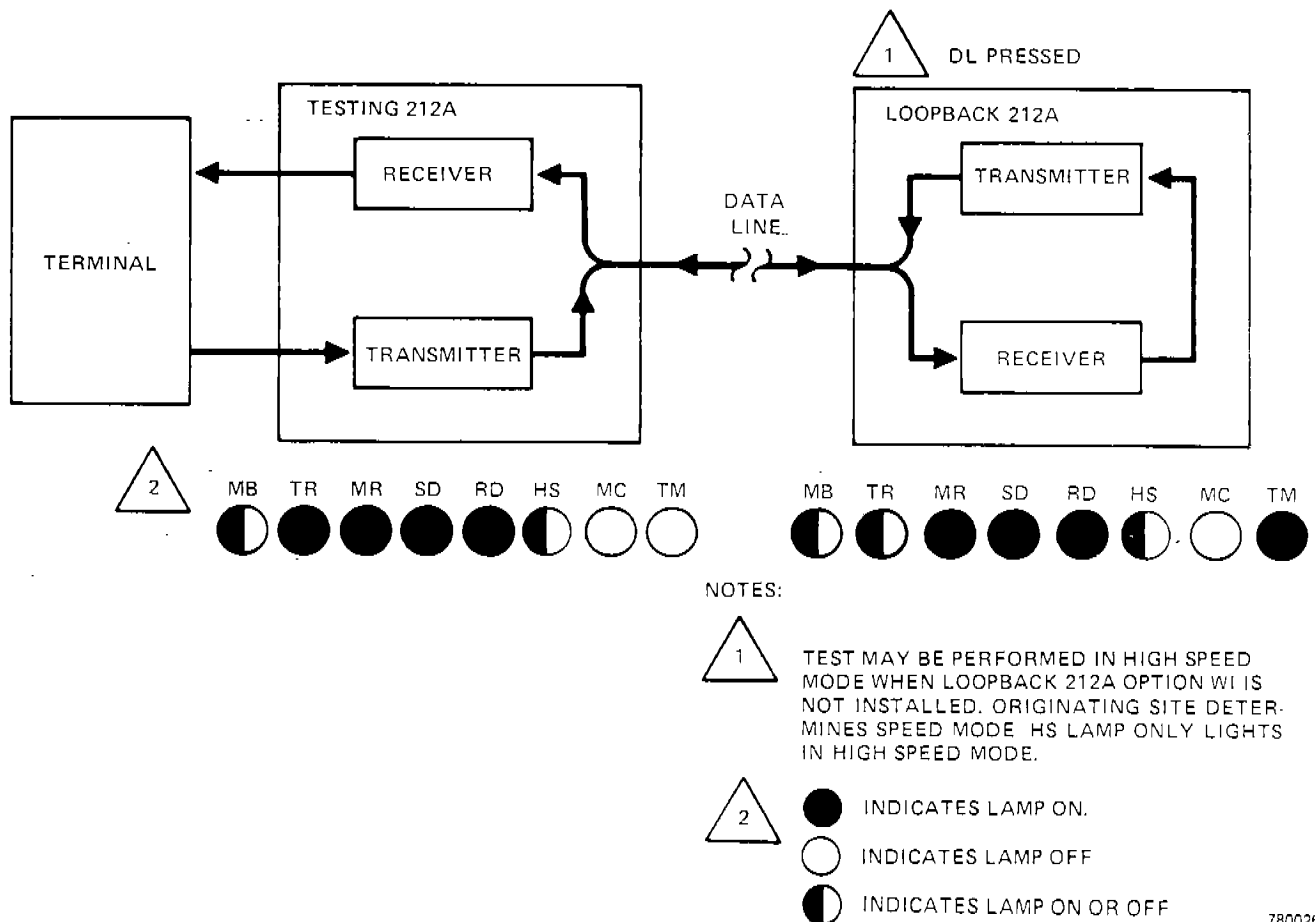


Fig. 3-6. Digital Loopback Test

780026

- (e) If testing site discontinues carrier or hangs up when in voice mode local data set disconnects.
- (f) If required, interchange the testing and loopback functions and repeat digital loopback test.
- (g) Press (release) DL pushbutton at loopback site to end test. TM lamp goes out. If loopback site is in data mode and loopback CD is on, the system is ready. If testing site is not in data mode or CD is off loopback site returns to idle mode.

### Alternate Methods

5.05 Refer to paragraph 3.05.

### A. Digital Loopback Self-test

5.06 Except for the remote terminal this test checks the same system components and interfaces that are checked during digital loopback. As shown in Fig. 3-7, this test has the advantages of a digital loopback test (listed in

paragraphs 5.01 and 5.02) on one end and the advantages of a self-test (listed in paragraph 4.01) at other end.

**NOTE:** For low speed testing the remote data set may be a T103J, T113D, or equivalent.

### 5.07 To perform the digital loopback self-test:

- (a) Press local (loopback) DL pushbutton and call attended site. Request ST pushbutton pressed and data set MC lamp be observed at remote (testing) site during test.
- (b) Enter data mode in normal manner. After line connection is made between loopback and testing data set observe that lamp pattern is as shown in Fig. 3-7. If testing is done in high speed mode data set HS lamp lights.
- (c) Originating data set determines testing speed mode. At testing site, the following requirements should be met:
  - In high speed mode MC lamp should not flash more than four times.

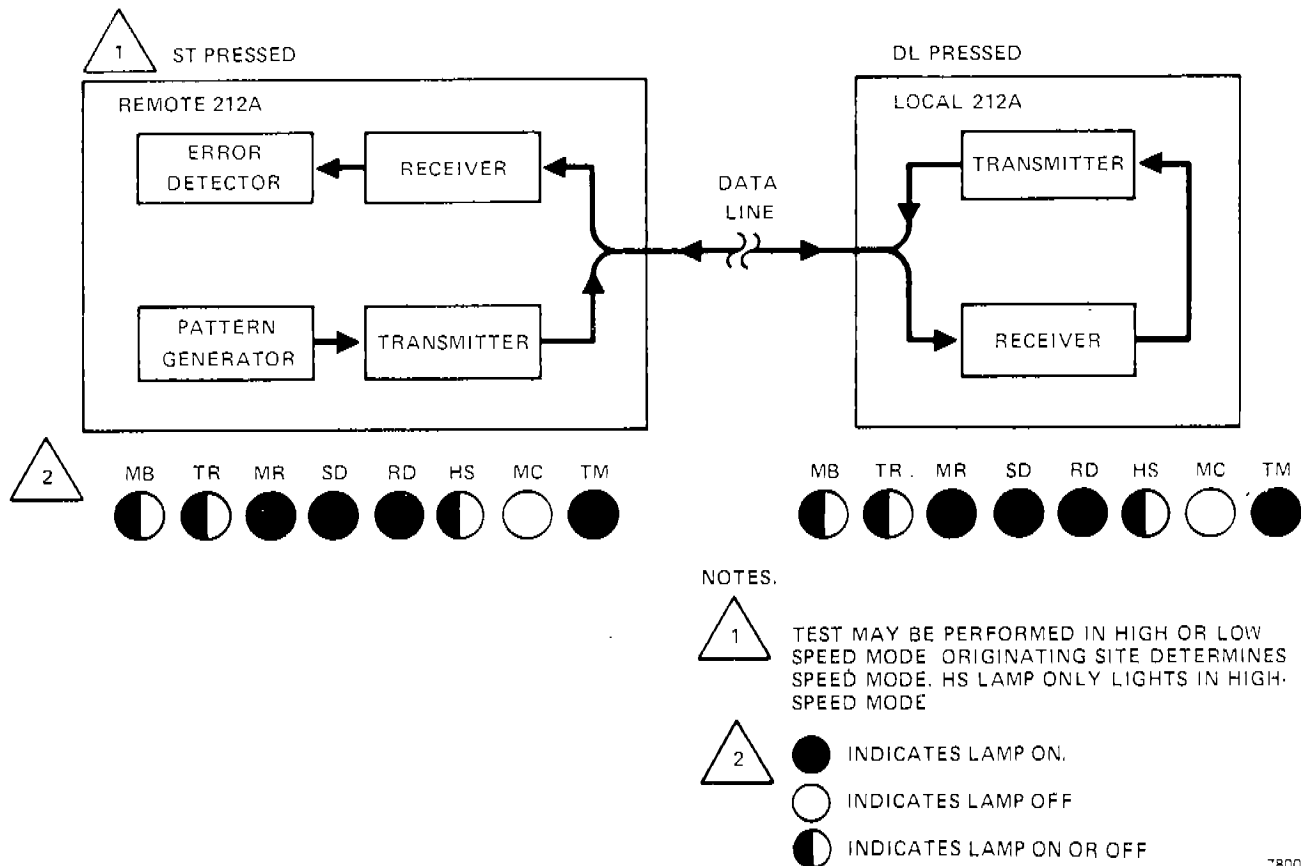


Fig. 3-7. Digital Loopback Self-Test

780027



- In low speed mode MC lamp stays off to indicate both data sets and data line check good. If MC lamp flashes or lights data round trip distortion is greater than 25 percent. Since round trip distortion may be additive no conclusion about proper operability of data sets and data line facility may be drawn.

- Resume voice mode after test and determine results. Request testing site press (release) ST pushbutton.
- If required, interchange the testing and loopback functions and repeat digital loopback self-test.
- Press (release) local DL pushbutton. If Cust. Int. indicator CD is on at both sites the system is ready for data transmission.

#### Alternate Methods

5.08 Refer to paragraph 3.05.

## 6. REMOTE DIGITAL LOOPBACK TEST

6.01 The remote digital loopback test automatically places a remote data set in the digital loopback configuration. A terminal generated test pattern is transmitted to the remote site and looped back to the local site through the local data set to the terminal. As shown in Fig. 3-8, the test checks the local data set, lines, remote set, local terminal, and interfaces between each system component. Round trip error accumulation should be measured at the local terminal.

#### Restrictions

6.02 Remote digital loopback tests may be performed only in the high speed mode. If local transmitter timing is optioned in slave position (WI) the test cannot be performed. The remote data set must have the receiver responds to remote digital loopback request feature optioned yes (YK). To digitally loop an unattended data set the remote site must have the automatic answer

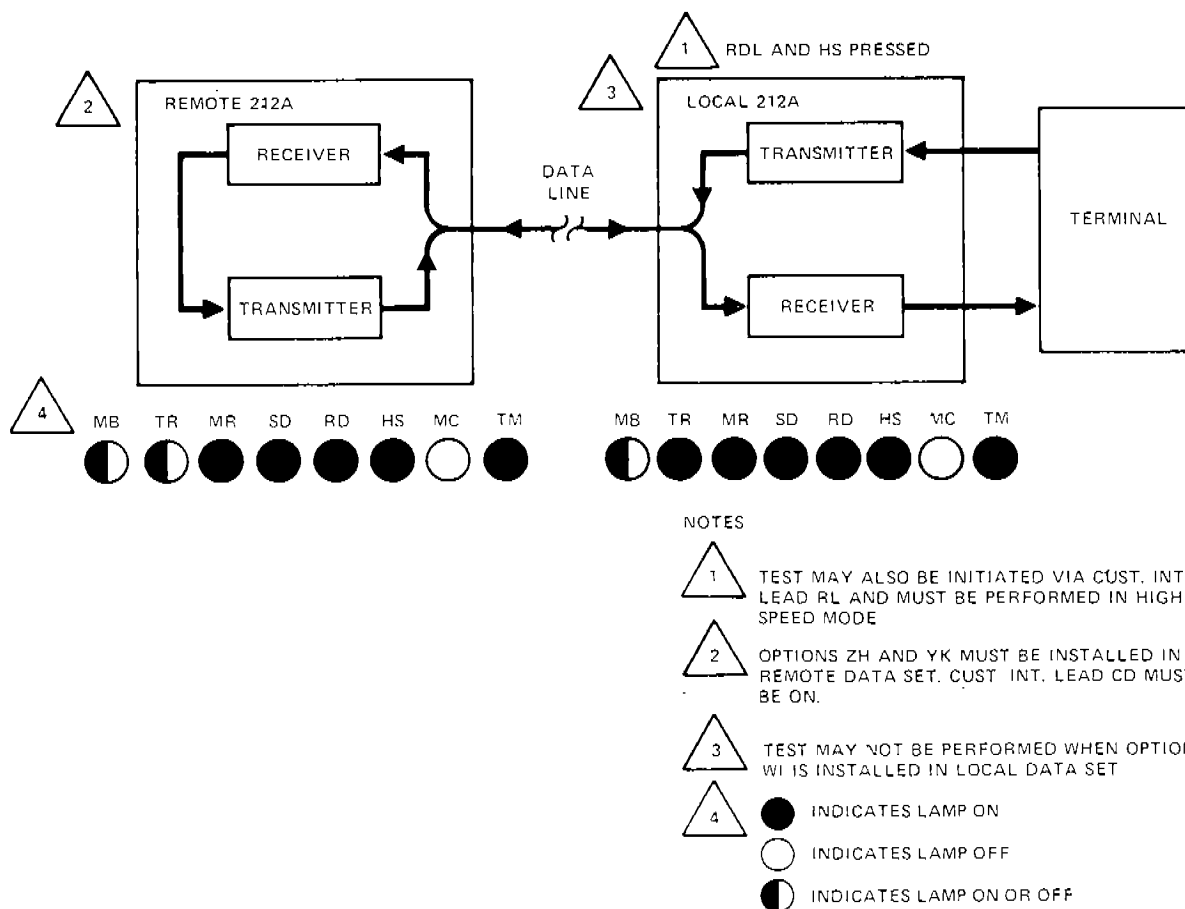


Fig. 3-8. Remote Digital Loopback Test

780026

feature optioned yes (ZH). Automatic answering data sets also require Cust. Int. Data Terminal Ready indicator (CD) on to complete answering sequence.

**6.03** To perform a remote digital loopback test:

- (a) Press HS and RDL pushbuttons at data set.
- (b) Place call to remote site and enter data mode in normal manner.
- (c) Verify that data set lamp pattern is as shown in Fig. 3-8. If MC lamp does not go out it may indicate that remote data set is not in digital loopback mode.
- (d) Refer to terminal procedures and apply recommended test inputs to data system. Verify that terminal receives proper return from data system.
- (e) To end test press (release) RDL pushbutton.
- (f) TM lamp goes out and normal transmission may proceed immediately.

**NOTE:** *Loss of carrier disconnect feature is forced into yes position (S) when test is initiated and remains in for duration of data mode.*

- (g) Remote data set drops line if local site is placed in talk mode.

#### Alternate Methods

**6.04** The data set can be conditioned to initiate remote digital loopback via Cust. Int. lead RL, pin 19. When Cust. Int. control of remote digital loopback feature is optioned yes and RL is set to on at an originating site the data set is preconditioned to begin remote digital loopback. Data set TM lamp does not light until actual remote digital loopback has been established.

**6.05** Cust. Int. leads RL and CH make remote digital loopback testing possible from the local terminal. Refer to paragraph 3.05.

#### A. Remote Digital Loopback Self-Test

**6.06** This test utilizes the advantages of the remote digital loopback test (listed in paragraph 6.01) and of the end-to-end self-test (listed in paragraph 4.01). As shown in Fig. 3-9, the test checks both data sets, line, and associated interfaces. The test is performed without a local terminal generated pattern.

#### Restrictions

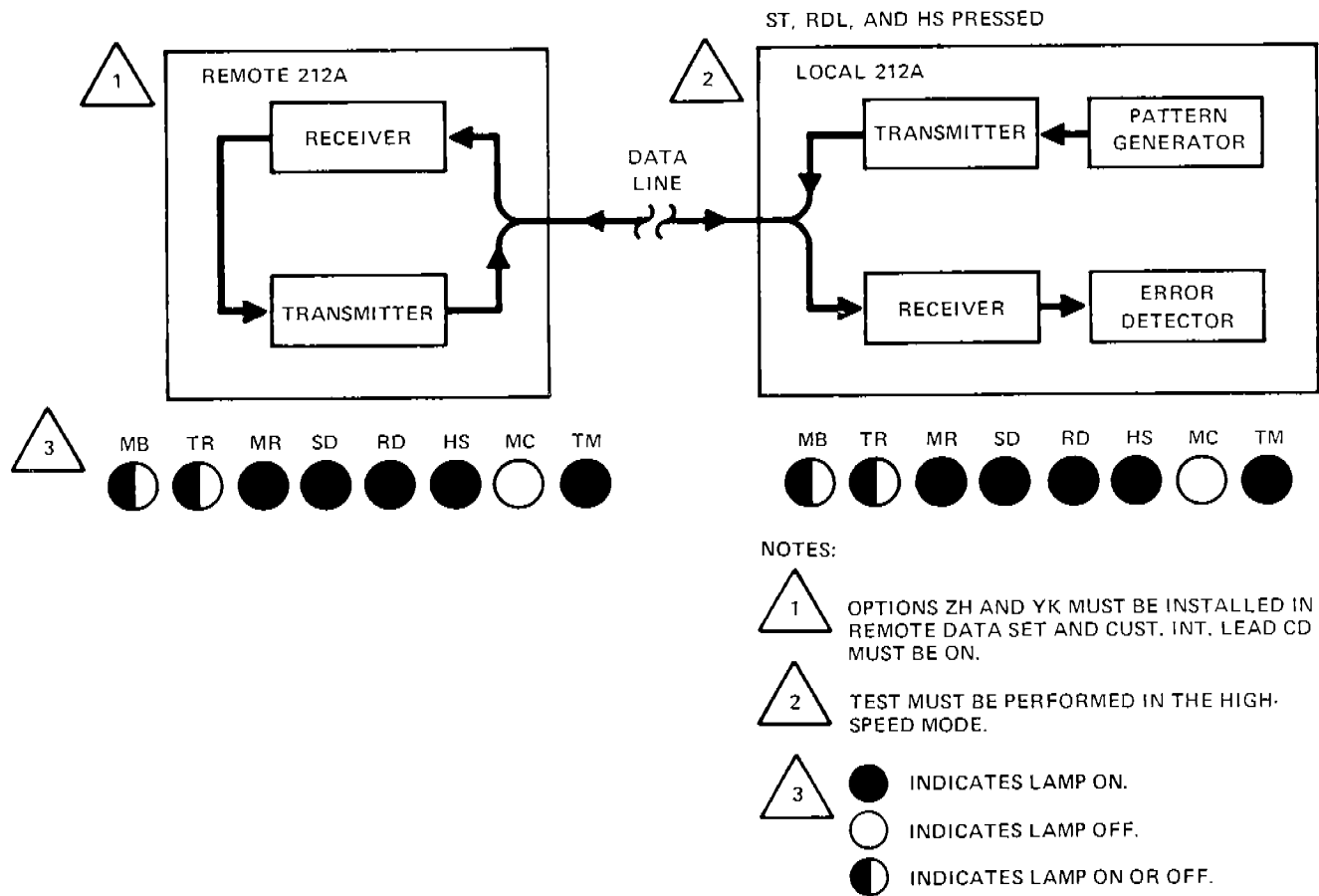
**6.07** Refer to paragraph 6.02. In addition to restrictions listed in paragraph 6.02, if Cust. Int. control of remote digital loopback feature is optioned yes, RL must be held off to enable ST pushbutton.

**6.08** To perform a remote digital loopback self-test:

- (a) Press data set HS, RDL, and ST pushbuttons.
- (b) Verify that data set TM lamp lights.
- (c) Place call to remote site and enter data mode in normal manner.
- (d) Observe that lamp pattern is the same as shown in Fig. 3-9. If MC lamp does not go out it may indicate that remote data set is not in digital loopback.
- (e) Observe MC lamp for 2 min. MC lamp should not flash more than six times.
- (f) To end test press (release) ST and RDL. If normal operation is in low speed mode press (release) HS pushbutton.
- (g) Line drops and data link must be re-established to begin normal transmission.

#### Alternate Methods

**6.09** Refer to paragraph 3.05.



780029

Fig. 3-9. Remote Digital Loopback Self-Test

7. REFERENCES

7.01 The following publications provide additional information for stand-alone and multiple installations using T212A Data Sets.

SECTION	TITLE		
5454-100	T212A Data Set Description and Operation	5454-200	T212A Data Set Installation and Connection
		5454-500	T212A Data Set Tests Using External Test Equipment
		5473	T212A Users Manual
		5492	T212A Maintenance Manual

## T212A DATA SET

### TESTS USING EXTERNAL TEST EQUIPMENT

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3. END-TO-END ERROR RATE .....	2
4. DIGITAL LOOPBACK ERROR RATE ...	2
5. IMPULSE NOISE TEST .....	2
6. REFERENCES .....	3

#### 1. GENERAL

##### A. Introduction

**1.01** Procedures required to test a T212A Data Set using external test equipment are contained in this section. The tests in this section are designed to check certain portions of the data set not tested by self-diagnostics or installation tests. The tests in this section should be performed after the self-diagnostic tests are completed and before calling the Rixon Data Test Center. On-line testing should be done between locations which best approximate working location.

**1.02** This section is being reissued to add references.

##### B. Pretest Checks

**1.03** Before performing the following test, verify that:

- The data set options have been correctly selected and noted for the service application.
- The telephone portion of the installation has been tested by the local telephone company and meets standard dc talk, signaling, and supervision requirements.
- The transmission loop (telephone line from data set location to nearest central office) has been tested by the local telephone company and meets requirements for data set operation over a switched network.

#### C. Required Equipment

**1.04** The following equipment is required to test a T212A Data Set using listed procedures:

- Sierra 1914C Data Test Set (DTS).
- Cable supplied with 1914C Data Test Set.
- A 565 or 2565 Telephone.
- 6H Impulse Noise Counter or equivalent (for impulse noise test only).
- Test cord with 310 plug on one end and alligator clips of tip and ring leads at other end (for impulse noise test only).

**R  
E  
A  
D**

Connect test equipment and set controls only as specified in the following procedures. Doing otherwise may damage the data set and test equipment.

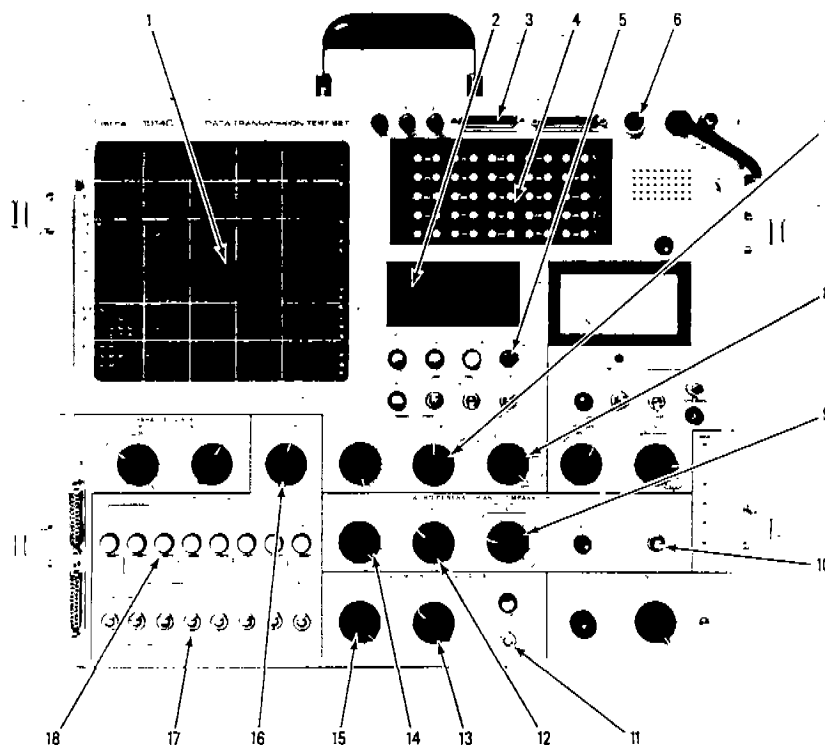
#### D. Control Locations

**1.05** Fig. 5-1 shows locations of 1914C Data Test Set (DTS) controls used during the test. Table 5-A lists control nomenclature.

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2040-AJ

Fig. 5-1. Sierra 1914C Data Transmission Test Set

## E. General Setup

**1.06** Chart 1 is a general setup of the 1914C DTS and data set options. References to this setup are made throughout the following procedures. If the general setup bypasses suspected problems in data set features further testing with the Rixon Data Test Center or an equivalent testing center is recommended.

## 2. ANALOG LOOPBACK ERROR RATE

**2.01** Chart 2 procedure checks the entire data set except certain option features and the telephone interface circuitry. The procedure listed in Chart 2 provides analog loopback testing in both high and low speed modes. Tests of Customer Interface Make Busy/Analog Loopback circuit (CN), Test Mode (TM), and Speed Mode (CI) indicator leads are also provided.

## 3. END-TO-END ERROR RATE

**3.01** Chart 3 procedure checks both the local and remote data set and interconnecting lines.

## 4. DIGITAL LOOPBACK ERROR RATE

**4.01** Chart 4 provides a procedure which checks local and remote data sets and interconnecting lines. The advantage of a digital loopback over an end-to-end self-test is that a DTS is only required at the local site. The high speed portion of the digital loopback test may be performed with an unattended remote data set. Refer to part 6 of the 200 section of this manual for a remote digital loopback procedure and substitute DTS for terminal. Cust. Int. RL lead is connected to DTS S3.

## 5. IMPULSE NOISE TEST

**5.01** If the data set and terminal are not connected to the same ground errors may be caused by potential difference between grounds. Chart 5 checks for impulse noise spikes and uses the 1914C to access ground leads of data set and terminal.

TABLE 5-A	
1914C DTS CONTROLS, INDICATORS, AND CONNECTORS	
FIG. 5-1 REF. NO.	DEVICE
1	Program matrix.
2	Counter display.
3	Connector A.
4	Interface selection switches.
5	RESET pushbutton.
6	POWER switch and lamp.
7	TEST SET MODE switch.
8	COUNTER switch.
9	Receive SAMPLE WIDTH switch.
10	WORD SYNC switch.
11	SIG LEV switch.
12	Receive WORD LENGTH switch.
13	Transmit WORD LENGTH switch.
14	Receive BIT RATE switch.
15	Transmit BIT RATE switch.
16	INTERFACE MODE switch.
17	CONTROL SIGNAL switches S1 through S8.
18	CONTROL SIGNAL lamps DS1 through DS8.

## 6. REFERENCES

6.01 The following publications provide additional information for stand-alone and multiple installations using T212A Data Sets.

SECTION	TITLE
5454-100	T212A Data Set Description and Operation.
5454-200	T212A Data Set Installation and Connection
5454-300	T212A Data Set Self-Diagnostics
5473	T212A Users Manual
5492	T212A Maintenance Manual

## CHART 1

## 1914C DTS AND T212A SETUP

STEP	ACTION	VERIFICATION
1	At DTS, ensure POWER switch is off.	DTS POWER indicator out.
2	At data set, ensure power is disconnected.	Data set MC lamp is out.
3	Disconnect data set cable from business machine and connect cable supplied with DTS between data set Cust. Int. connector and Connector A of DTS.	Fig. 5-1, Ref. No. 3.
4	Place all 1914C DTS program pins in matrix STG positions, then program matrix by placing one red program pin at each matrix position specified below:  Horizontal row / Vertical row 1 / GRD 2 / SD 2 / DS2 3 / RD 3 / DS3 4 / S4 5 / DS5 6 / DS6 7 / GRD 8 / DS8 12 / DS1 15 / SCT 17 / SCR 18 / DS4 19 / S3 20 / DS7 20 / S7 23 / S1 25 / S8	Fig. 5-1, Ref. No. 1.
5	Ensure all interface selector switches are pushed in.	Fig. 5-1, Ref. No. 4.
6	Set TEST SET MODE switch to SER.	Fig. 5-1, Ref. No. 7.
7	Set Counter switch to BIT ERRORS.	Fig. 5-1, Ref. No. 8.
8	Set Receive SAMPLE WIDTH switch to .5 $\mu$ S.	Fig. 5-1, Ref. No. 9.
9	Set WORD SYNC switch to OFF.	Fig. 5-1, Ref. No. 10.
10	Set SIG LEV switch to $\pm$ 4V.	Fig. 5-1, Ref. No. 11.

CHART 1 (Cont)

STEP	ACTION	VERIFICATION
11	Set Receive WORD LENGTH switch to 63.	Fig. 5-1, Ref. No. 12.
12	Set Transmit WORD LENGTH switch to 63.	Fig. 5-1, Ref. No. 13.
13	Set Receive BIT RATE switch to 300.	Fig. 5-1, Ref. No. 14.
14	Set Transmit BIT RATE switch to 300.	Fig. 5-1, Ref. No. 15.
15	Set INTERFACE MODE switch to VOLTAGE.	Fig. 5-1, Ref. No. 16.
16	Set all CONTROL SIGNAL switches except S7 to OFF. Set S7 to ON.	Fig. 5-1, Ref. No. 17.
17	Lamps DS1 through DS8 provide interface lead indications as follows:  DS1 ..... Speed Mode DS2 ..... Transmit Data DS3 ..... Receive Data DS4 ..... Test Mode DS5 ..... Clear To Send DS6 ..... Data Set Ready DS7 ..... Data Terminal Ready DS8 ..... Carrier Detect	Fig. 5-1, Ref. No. 18.
18	At T212A Data Set install or verify installation of the following options:  • 1200 bps operation feature to sync. (YH).  • Data rate indication on CI feature to yes (YQ).  • Transmitter timing feature to internal (YC).  • Cust. Int. CN and TM lead positions to CN-pin 25, TM-pin 18.  • Data rate feature to dual (YP).	S6-8, S6-9, and S9-3 down.  S6-6 down.  S7-1 and S7-2 up.  S6-1 and S6-4 up. S6-2 and S6-3 down.  S10-1 up.



## CHART 2

## ANALOG LOOPBACK ERROR RATE

STEP	ACTION	VERIFICATION
1	Perform setup as indicated in Chart 1.	
2	Connect data set power and at DTS press POWER switch.	Data set MC and DTS POWER lamps light.
3	Verify that data set is in low speed mode.	Data set HS pushbutton is out and HS lamp is off.
4	At data set press AL pushbutton.	Data set TM, DTS DS3, DS4, DS5, and DS8 lamps light.
5	At DTS set FUNCTION switch to PHASE ADJ and adjust PHASE control to zero meter. Reset FUNCTION switch to OFF.	Meter indicates zero.
6	Press and release WORD SYNC switch to MAN position.	Counter stops.
7	Press and release counter RESET pushbutton.	Counter indicates 00.
8	Allow error rate to run for 1 min.	Counter should stay at 00.
9	If Cust. Int. control of CN feature is optioned yes (YE) press (release) AL pushbutton and set DTS S8 to on.	Data set TM, DTS DS3, DS4, DS5, and DS8 lamps light.
10	At DTS set transmit and receive BIT RATE switches to EXT +. AT data set press HS pushbutton.	Data set HS and DTS DS1 lamps light.
<p><b>NOTE:</b> If data rate control feature is optioned Cust. Int. CH position, HS pushbutton does not function. Set DTS S1 on when procedure states press (to engage) data set HS; set DTS S1 off when procedure states press (release) data set HS pushbutton.</p>		
11	At DTS press and release WORD SYNC switch to MAN position.	Counter stops.
12	Press and release counter RESET pushbutton.	Counter indicates 00.
13	Allow error rate to run for 1 min.	Counter should stay at 00.

## CHART 2 (Cont)

STEP	ACTION	VERIFICATION
14	To return data set to normal operation press (to release) data set AL and HS pushbuttons. Press (to release) DTS POWER pushbutton.	Data set TM lamp and DTS POWER lamp go out.
15	Disconnect data set power.	Data set MC lamp goes out.
16	If further testing is required continue to next Chart, otherwise, reset data set options to applicable positions. Reconnect data set to terminal and restore ac power.	

## CHART 3

## END-TO-END ERROR RATE

STEP	ACTION	VERIFICATION
1	Perform setup as described in Chart 1. Call remote site and request that same procedure is followed.	
2	Press and release DTS POWER switch; at data set, connect ac power.	DTS POWER and data set MC lamps light.
3	Verify that data set is in low speed mode at both local and remote sites.	Data set HS pushbutton is released and HS lamp is out.
4	Enter data mode at both sites.	DTS DS5, DS6, and DS8 lamps light.
	<b>NOTE:</b> If DTS NO DATA lamp goes out a valid connection has been established. If NO DATA lamp lights during test return to Step 4 and restart test.	
5	At DTS set FUNCTION switch to PHASE ADJ and adjust PHASE control to zero meter.	Meter indicates zero.

CHART 3 (Cont)

STEP	ACTION	VERIFICATION
6	Press and release WORD SYNC switch to MAN position.	Counter stops.
7	Press and release counter RESET pushbutton.	Counter indicates 00.
8	Allow error rate to run for 3 min.	Should be less than 2 errors.
9	Reestablish voice communication after error rate. Set transmit and receive BIT RATE switches to EXT + at both sites.	
10	At both data sets press HS pushbutton and repeat Steps 6, 7, and 8.	Should be less than 4 errors.
	<p><b>NOTE:</b> If data rate control feature is optioned Cust. Int. CH position, HS pushbutton does not function. Set DTS S1 on when procedure states press (to engage) data set HS; set DTS S1 off when procedure states press (release) data set HS pushbutton.</p>	
11	To return data set to normal operation press (to release) data set HS pushbutton. Press (to release) DTS POWER pushbutton.	Data set MC lamp lights. DTS POWER lamp goes out.
12	Disconnect data set power.	Data set MC lamp goes out.
13	If further testing is required continue to next Chart, otherwise, reset data set options to applicable positions. Reconnect data set to terminal and restore ac power.	

## CHART 4

## DIGITAL LOOPBACK ERROR RATE

STEP	ACTION	VERIFICATION
1	Perform setup as described in Chart 1. Ensure all switches on local data set are released. Press and release DTS POWER switch and at local data set connect ac power.	DTS POWER and data set MC lamps light.
2	Call remote site and request data set DL pushbutton pressed and verify all other pushbuttons are in normal position.	Remote data set TM lamp lights.
3	Verify that data set is in low speed mode at both local and remote sites.	Data set HS pushbutton is released and HS lamp is out.
4	Go into data mode at both sites.  <b>NOTE:</b> <i>If DTS NO DATA lamp goes out a valid connection has been established. If NO DATA lamp lights during test return to Step 4 and restart test.</i>	DTS DS5, DS6, and DS8 lamps light.
5	At DTS set FUNCTION switch to PHASE ADJ and adjust PHASE control to zero meter.	Meter indicates zero.
6	Press and release WORD SYNC switch to MAN position.	Counter stops.
7	Press and release counter RESET pushbutton.	Counter indicates 00.
8	Allow error rate to run for 3 min.	Should be less than 3 errors.
9	Reestablish voice communication after error rate. Set transmit and receive BIT RATE switches to EXT + at both sites.	

## CHART 4 (Cont)

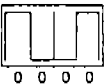
STEP	ACTION	VERIFICATION
10	Press HS pushbutton at local data set then go back to data mode at both sites.  <b>NOTE:</b> <i>If data rate control feature is optioned Cust. Int. CH position, HS pushbutton does not function. Set DTS S1 on when procedure states press (to engage) data set HS; set DTS S1 off when procedure states press (release) data set HS pushbutton.</i>	Data set HS and TM lamps light when connection is established.
11	Repeat Steps 6, 7, and 8.	Should be less than 6 errors.
12	Reestablish voice communication after error rate and have remote DL pressed (to release). To return data set to normal operation press (to release) HS pushbutton. Press to release DTS POWER pushbutton. Terminate call.	Data set MC lamp lights. DTS POWER lamp goes out.
13	Disconnect data set power.	Data set MC lamp goes out.
14	If further testing is required continue to next Chart, otherwise, reset data set options to applicable positions. Reconnect data set to terminal and restore ac power.	

## CHART 5

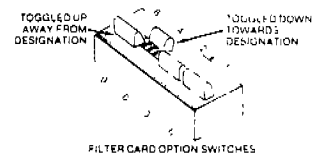
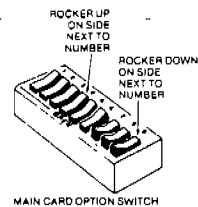
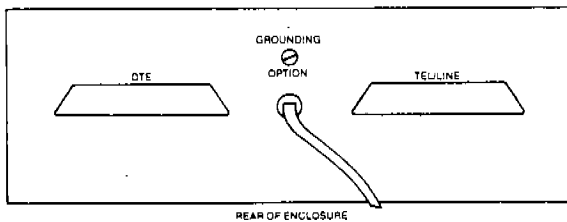
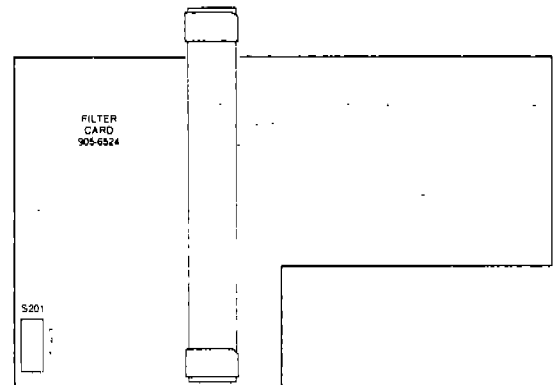
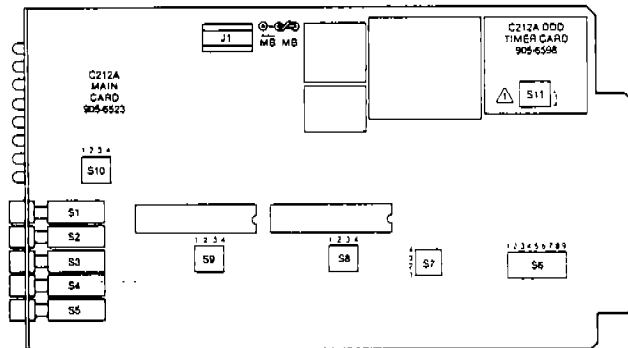
## IMPULSE NOISE TEST

STEP	ACTION	VERIFICATION
1	Isolate 6H Impulse Noise Counter earth ground using a 3-to-2 adapter between counter power cord and ac power receptacle.	
2	Place all DTS matrix programming pins in STG positions.	Fig. 5-1, Ref. No. 1.
3	At interface selection switches pull out A1, B1, A7, and B7.	Fig. 5-1, Ref. No. 4.
4	Connect impulse noise counter, data set, and terminal as follows: <ul style="list-style-type: none"> <li>• Data set to DTS connector A.</li> <li>• Terminal to DTS connector B.</li> <li>• Impulse noise counter 310 MEAS jack to DTS selection switch post A7 and B7.</li> </ul>	
5	At impulse noise counter set DIAL-MEAS switch to MEAS and DBRN control to 90. Reset counter to 0000 and set interval timer to 15.	
6	Record any counter reading at end of interval.	Should be 0000.
7	Disconnect alligator clips and reconnect to A1 and B1. Repeat Steps 5 and 6.	Should be 0000 after interval.
8	If any impulses are recorded data set and terminal power grounds must be bonded together in accordance with local bonding instructions.	
9	Return all equipment to normal operation. Disconnect DTS and impulse noise counter. Reset data set options to applicable positions, reconnect data set to terminal, and restore ac power.	

# T212A TELEPHONE COMPANY SELECTED OPTIONS

FEATURE	OPTION	GENERAL DESCRIPTION	WECO DESIG.	MARK SELECTION	SWITCH OR JUMPER POSITION	LOCATION
Transmit Signal Range *0 to -15 dBm. When used in registered applications where the cable supplied with the modem determines the transmit level, set the attenuator position to 0.	*0 to -15 dBm	Option allows telephone company personnel to select transmitter levels between 0 and -15 dBm in 1 -dB steps if data modem is used in adjustable transmit level arrangements. For transmit level arrangements other than adjustable leave in *0 dBm position.	—		 8 4 2 1 0 0 0 0	S201 on filter card
Tip-ring Make Busy	In	If data modem is made busy by CN circuit or front panel AL pushbutton, it is disconnected from the line and a resistor is connected between tip and ring. Primarily used when modem is operated behind line hunting equipment.	F		Jumper in MB position	Jumper on main card
	Out	If data modem is made busy by CN circuit or front panel AL pushbutton, it is disconnected from the line but a resistor is not connected between tip and ring.	E		Jumper in $\overline{MB}$ position	
Signal and Frame Ground	Common	Ties signal ground to the metal case (frame ground) of the data modem. Used to reduce longitudinal noise from the power line.	*Q		Screw switch closed	Rear panel
	Separate	Isolates signal ground from frame ground.	P		Screw switch open	

\* Factory installed option.



## NOTES

- SWITCH S11 ON SERIES 9 AND ABOVE DATA MODEMS ONLY
- SWITCHES MUST BE FULLY TO ONE SIDE OR THE OTHER THE SWITCHES ARE NOT FUNCTIONAL IN CENTER POSITIONS

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# T212A USER SELECTED OPTIONS

FEATURE	OPTION	GENERAL DESCRIPTION	WECO DESIG.	MARK SELECTION	SWITCH OR JUMPER POSITION	LOCATION
Transmitter Timing	INT	Data modem internal bit rate clock runs transmitter and is supplied to terminal at DB lead.	*YC		S7-1U, S7-2U	S7 on main card
	EXT	Transmitter clock is phase-locked to customer provided external source via DA lead.	YD		S7-1D, S7-2U	
	Slave	Transmitter clock is phase-locked to Receive Timing Element lead DD which is derived from received data. Used in multiplexing and other systems.  <b>NOTE: Transmitter timing options only affect high speed mode operation. YC must be selected for character-asynchronous operation.</b>	WI		S7-1U, S7-2D	
Answer Mode Indication	CE ON	Data modem CE lead is on during ringing and data mode of answered calls. Used with terminals which need originated/answered call indication from data modems.	X		S7-4D	
	CE OFF	Data modem CE lead is on during ringing. Used with terminals which only need ring indication at beginning of call.	*W		S7-4U	
Automatic Answer	In	If Data Terminal Ready indication CD is on data modem automatically answers incoming calls. Normally used to provide unattended answering.	ZH		S8-1U	S8 on main card
	Out	Prevents automatic answering.	ZG		S8-1D	
Send Space Disconnect	In	Data modem transmits space signal for about 4 seconds before disconnecting. Used where remote site has option V or equivalent installed.	*T		S8-2D	
	Out	Data mode disconnects without automatically sending a long space.	U		S8-2U	
Receive Space Disconnect	In	If continuous space is received for approximately 2 seconds data modem automatically disconnects from data line. Used where remote site has option T or equivalent installed.	*V		S8-3D	
	Out	Prevents automatic disconnect when long space is received.	Y		S8-3U	
Loss of Carrier Disconnect	In	If carrier is interrupted for longer than 410 ms during data mode data modem disconnects from line.	*S		S8-4D	
	Out	Prevents automatic disconnect by carrier interruption.	R		S8-4U	
Receiver Responds to Remote Digital Loopback	In	Data modem is automatically placed in digital loopback by request from remote T212A Data Modem in high speed mode.	*YK		S9-1U	S9 on main card
	Out	Blocks automatic digital loopback testing.	YL		S9-1D	
CB and CF Indications	Common	Clear To Send interface lead is connected to follow operation of Carrier Detected interface lead CF.	*A		S9-4D	
	Separate	CB lead is not affected by CF in any way.	B		S9-4U	
CN and TM Interface Assignment	CN 25, TM NC	CN lead at pin 25, TM lead not connected.	*XO		S6-1U, S6-2U, S6-3D, S6-4U	S6 on main card
	CN 18, TM NC	CN lead at pin 18, TM lead not connected.	XN		S6-1U, S6-2U, S6-3U, S6-4D	
	CN 18, TM 25	CN lead at pin 18, TM lead at pin 25.	XR		S6-1D, S6-2U, S6-3U, S6-4D	
	CN 25, TM 18	CN lead at pin 25, TM lead at pin 18.	—		S6-1U, S6-2D, S6-3D, S6-4U	
Interface Control of RDL Lead	In	In high speed mode remote unattended T212A Data Modem is placed in digital loopback when RL lead is on during call origination.	XL		S6-5D	
	Out	Remote digital loopback initiation is not under terminal control. Only front panel RDL switch initiates remote digital loopback.	*XM		S6-5U	

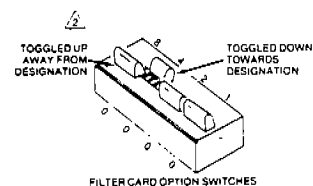
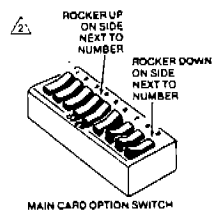
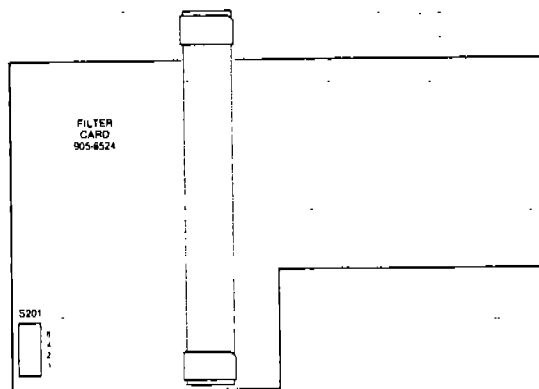
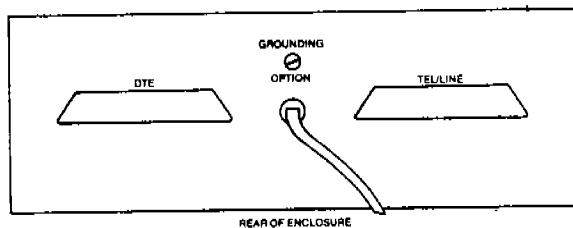
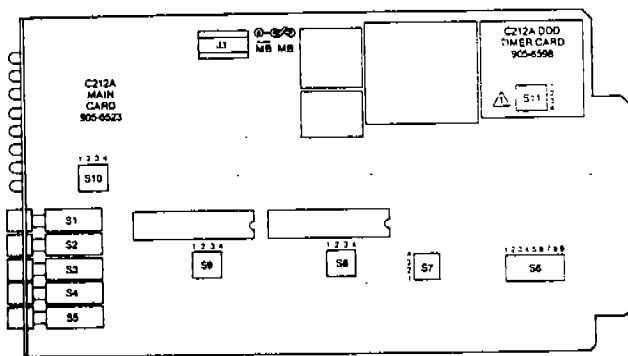


# T212A USER SELECTED OPTIONS (Cont)

FEATURE		OPTION	GENERAL DESCRIPTION	WECO DESIG.	MARK SELECTION	SWITCH OR JUMPER POSITION	LOCATION
Speed Control		Interface CH	Originating speed mode selection is determined by Data Rate Selector lead (CH) status (on for high speed and off for low speed).	XJ		S6-7D, S10-4U	S6 and S10 on main card
		HS Button	Front panel HS switch determines speed mode and CH lead is ignored.	*XK		S6-7U, S10-4D	
Interface Speed Indication CI		In	Speed Mode Indicator lead CI goes on only during high speed mode.	YQ		S6-6D	S6 on main card
		Out	CI lead is open at all times.	*YR		S6-6U	
Speed Mode		High only	Prevents originating or answering low speed data calls.	YO		S10-1D	S10 on main card
		Dual	Utilizes full T212A operating capability.	*YP		S10-1U	
Interface Control MB/AL CN Lead		In	Make Busy/Analog Loopback circuit CN is activated when CN lead is on, open, or grounded. Terminal holds CN lead negative during normal operation. Activating CN circuit disconnects data modem from line. If tip and ring Make Busy is installed, activating CN circuit also makes line busy. If CD lead and CN circuit are on, data modem automatically goes into analog loopback test mode.	YE		S10-2U	
		Out	CN lead is ignored.	*YF		S10-2D	
CC Indication for Analog Loopback		On	Data Set Ready Indication CC goes on during analog loopback test. Certain terminals require CC on to perform analog loopback.	*ZF		S10-3D	
		Off	CC only goes on when data modem is in data mode.	ZE		S10-3U	
1200 BPS Operation		Sync	1200 bps operation is in synchronous format.	YH		S6-8D, S6-9D, S9-3D	S6 and S9 on main card
		Async	1200 bps operation is in character asynchronous format and either YI or YJ must also be selected.	*YG		S6-8U, S6-9U, S9-3U	
Character Length (Use with YG)		9-bit	Nine-bit character length includes seven information, one start, and one stop bit.	YI		S9-2U	S9 on main card
		10-bit	Ten-bit character length includes eight information, one start, and one stop bit.  <b>NOTE:</b> When YG option is selected character length option YI and YJ must also be selected. System format determines appropriate setting.	*YJ		S9-2D	
†Tele- phone Set Used	Series 4 Thro- ugh 8	500/565	Required in standard configurations which do not use RTC tele- phones.	*—		S7-3U	S7 on main card
		RTC	Only required in configurations which use RTC telephones.	—		S7-3D	
	Series 9 and Higher	500/565	Required in standard configurations which do not use RTC telephones	*—		S11-2U, S11-3U, S11-4D	S11 on main card
		RTC	Only required in configurations which use RTC telephones.	—		S11-2D, S11-3D, S11-4U	

\* Factory installed option.

† Provided on Series 4 and higher data modems only.



- NOTES
- ⚠ SWITCH S11 ON SERIES 9 AND ABOVE DATA MODEMS ONLY
  - ⚠ SWITCHES MUST BE FULLY TO ONE SIDE OR THE OTHER THE SWITCHES ARE NOT FUNCTIONAL IN CENTER POSITIONS

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